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Original Communications.

ARTICLE XIV.—*On Geranium Maculatum. By R. Eglesfeld Griffith, M.D.*

Nat. Ord. GERANICEÆ.

Sex. Syst. MONODELPHIA DECANDRIA.

GERANIUM. *Calyx*, 5-leaved. *Petals*, 5, regular. *Nectarium*, 5 melliferous glands adnate to the base of the longer filaments. *Arilli*, 5, 1-seeded, awned, awns naked and straight.—*Nuttall.*

G. maculatum. Erect, retrorsely pubescent; stem dichotomous; leaves opposite; 3-5 parted, incised; upper ones sessile; peduncles elongated; two flowered; petals obovate.—*Willdenow.*

Synon. *G. Noveboracense.* Amœn. Acad. vol. 4, p. 522.

G. caule erecto herbaceo, foliis oppositis quinquepartitis incisis, &c. Cavanilles.

G. batrachioides Americanum maculatum, &c. Dillenius. Hort. Elth.

G. maculatum. L. Sp. pl. 955. Mich. Fl. Bor. Am. vol. 2, p. 38. Bigelow, Med. Bot. p. 84. Muhl. Cat. Pl. Am. sep. p. 62. Barton, Comp. Fl. Phil. vol. 2, p. 63. Nuttall, Gen. vol. 2, p. 80.

Icon. Dill. Elth. t. 131, f. 159. Bigelow, Med. Bot. t. 8. Barton, Med. Bot. t. 13.

Common names. Crowfoot. Alum Root. Common Cranes Bill, &c.
Pharm. Geranium, U. S. Pharm.
Offic. Root. Thick, rough, knobby, of a dark brown colour externally, of a pale flesh colour internally; taste astringent without being bitter; inodorous.

Description. Root perennial, irregularly gibbous and horizontal, brownish mottled with green externally, and greenish white internally. From the root spring a number of radical leaves and one or more stems; these are erect and terete, of a green colour, and furnished with reflexed hairs. At the height of six, eight or ten inches from the ground, the stem becomes forked; and at the point of division is furnished with two large petiolate leaves which are generally reflexed. Leaves on the upper part of the stem either with very short petioles or sessile. The peduncles arise from the dichotomous divisions of the stem, and support two flowers on short pedicels. The calyx consists of five oval, lanceolate, ribbed, cuspidate segments, plumosely ciliate on their outer margin and membraneous on the other; sometimes three of the segments only are ciliate. Petals five, obovate, not emarginate. Stamens ten, furnished at base with glands, and terminated by oblong convex deciduous anthers of a purple colour. Germ ovate. Style persistent, the length of the stamens at first, but afterwards becoming elongated. Stigmas five. Capsule containing five seeds, which, when mature, become detached by the elasticity of the awns.

There are several varieties both as respects the form of the foliage and the colour of the flowers; those which have been founded on the relative size and mode of growth appear to depend solely on accidental causes, as soil, exposure, &c. It is a beautiful plant, deserving of cultivation.

Habitat. This species is found in all parts of the United States, generally growing in hedges, borders of damp woods, usually flourishing most luxuriantly in low grounds, though it is by no means confined to these situations. It flowers in the spring about May.

Bot. History. The genus Geranium, which derives its

name from a Greek word signifying a crane, from the supposed resemblance between its persistent style and the bill of that bird, was formerly very extensive and included many anomalous species. L'Heritier, however, divided it into, *Pelargonium*, consisting chiefly of the herbaceous species with seven stamens, principally natives of southern Africa, and extensively cultivated in our greenhouses; *Erodium*, or those species having but five stamens, and *Geranium*, which is restricted to such as are furnished with ten of these organs.

Med. History. The Geranium appears to have been well known to, and highly prized by, the aboriginal inhabitants of the United States, and to have been employed by them in all cases where astringents were supposed to be useful. The first account, however, of its medical virtues, as far as we have been able to ascertain, was given by Coelln in the fourth volume of the Amœnitates Academicæ, on the authority of Cadwallader Colden; he states that it was found useful in dysenteries, "decoctum radicis hujus plantæ ad dysenteriam nostratibus in usu est." Shoepf, who appears to have considered that every plant, from "the hyssop which grows on the wall, to the cedar of Libanus," must be possessed of some medicinal properties, was not likely to pass over one which manifested such marked qualities as the Geranium; he observes of it, "radix leviter astringens, vulneraria habetur et ad dysenteriam laudatur." Subsequently it was recognized as a regular article of the materia medica, and has been admitted into the primary catalogue of medicinal substances in the United States Pharmacopœia.

Medical Properties and Uses. The united testimony of all medical practitioners, who have given the Geranium a fair trial, amply verifies its powerfully astringent properties, and that it is at least equal to kino in all cases to which that resin is applicable. As to the peculiar and specific powers which have been ascribed to it by some writers, they are wholly fallacious. The too common custom of overrating the remedial virtues of different articles of the materia medica, has been

productive of injury, and has tended in no slight degree to retard the advance of therapeutic knowledge. Accident, or a combination of circumstances, may render the employment of a certain plant or preparation exceedingly successful in the hands of a practitioner; and the consequence naturally is, that he either holds it out to the world as a specific, or at least bestows on it such unqualified praise, as to lead to its general use; in most instances disappointment is the result, not that the article may not in reality be a valuable addition to the materia medica, but that too much has been expected from it in the cure or alleviation of disease. This has a tendency to bring it into actual discredit, instead of settling its proper sphere of usefulness, and of occasioning the neglect of a medicine that under other circumstances might have proved eminently beneficial. To be enabled then to judge of the real powers of the article under consideration, it is necessary to refer to the testimony of those who have witnessed its remedial effects. The nature of this Journal will, however, prevent our entering into this subject in any detail, and compels us to a mere statement of the results obtained by different practitioners; neither is this a proper place to discuss whether the practice of employing astringents in dysentery or diarrhœa is not contra-indicated by the laws of physiology and just reasoning; all that is wished, is to establish the relative value of the Geranium as regards other articles of the same class.

The testimonies of Colden and Shoepf, in relation to the supposed efficacy of the Geranium in dysentery, have already been adverted to; to which may be added that in many parts of the United States it is familiarly known under the name of alum root, and is used in the secondary stages of bowel complaints. In cholera infantum the late Professor Barton recommended a decoction of it in milk, and Dr Eberle states that it is extensively used for this complaint by the inhabitants of Lancaster county.

In hemorrhages, as may be *a priori* supposed, it has been resorted to with various degrees of success, and it is probable

that it is fully equal to any other article of the vegetable astringent class, in those few cases where this mode of treatment is indicated. As a remedy in aphthous affections of the mouth and in ulcerations of the fauces and tonsils, consecutive to cynanche tonsillaris, much more is to be expected from it when used as a gargle. Dr Eberle states, "I have frequently used a strong decoction of the root, the *Geranium Maculatum*, in cynanche tonsillaris, and sometimes with evident advantage. As a gargle in ulcers of the tongue and fauces, I have found it highly useful. In a chronic and very obstinate case of aphthous ulceration of the mouth, after various articles had been used by other physicians and myself unsuccessfully, the patient was relieved by the use of gargles made of the root of this plant." This testimony of Dr Eberle is confirmed by Zollickoffer and others.

As to the suggestion of Professor Barton, that it might prove useful in nephritis, we agree with the author of "Vegetable Materia Medica of the United States," that it is not entitled to much weight, as it certainly does not possess any diuretic properties; in the convalescence from this complaint it may, however, have occasionally been beneficial as a tonic.

In gonorrhœa the infusion has done some good as an injection, acting in all probability in the same manner as the more commonly employed articles of sugar of lead and sulphate of zinc.

In fact, we have before stated, the Geranium is a powerful astringent, and, like the rest of its class, is often of service in the secondary stages of some inflammatory complaints, but is always contra-indicated prior to the reduction of general or local excitement by antiphlogistics.

Pharm. Preparations and Mode of Administration. The Geranium may be given in a variety of modes, in tincture, decoction, infusion, in powder and in extract. The dose of the first is from two to four drachms, of the powder from fifteen to forty grains, of the extract from ten to twenty grains. The decoction is made by boiling one ounce of the

root in half a pint of water, of which one or two tablespoons full may be administered at a time. The infusion is made in the same proportions, but the dose is somewhat larger.

Analysis. Dr Bigelow gives the result of an examination of this root, and states that it contains gallic acid and tannin, affording a larger precipitate than kino on being treated with gelatin. A later series of observations by Dr Staples (Journ. Pharm. Vol. I. p. 171) show that it contains a large quantity of gallic acid, tannin, mucilage in small proportion, amadin, red colouring matter, which is principally furnished by the cortical portion of the root, a small quantity of resin, and a crystallizable vegetable principle.

ARTICLE XV.—*Observations on the Pharmacopœia of the United States. By George B. Wood, M. D., Professor of Materia Medica and Pharmacy in the Philadelphia College of Pharmacy.*

[Continued from Vol. III. p. 304.]

In a late edition of the work entitled "The American Dispensatory, by John Redman Coxe, M.D." numerous critical annotations upon the United States Pharmacopœia of 1830 have been introduced, which, as they may produce erroneous impressions upon those who are not familiar with pharmaceutical subjects, require a more particular notice than may, perhaps, be due to their intrinsic merit. It is highly desirable that the Pharmacopœia should possess, as well as deserve, the general confidence; and its friends are bound not only to make the public acquainted with what they conceive to be its merits, but to protect it, as much as may lie in their power, from the influence of unfavourable and incorrect criticism. The con-

nexion of the writer with the Pharmacopœia, as one of the publishing committee, renders it peculiarly proper that he should appear in its defence; as he may be supposed to be familiar with the considerations which influenced any particular modification of the original work, and therefore better qualified than one wholly unconcerned in its preparation, to explain difficulties, or to answer objections which may be brought against it. The editor of the Dispensatory has been pleased to designate the work in question, from the place where it was printed, as the Philadelphia Pharmacopœia; though, as it comes out under the authority of a convention assembled at Washington from different parts of the union, he might, with greater propriety, have given it the name of the latter city, if determined to withhold the courtesy of acknowledging the title to which it lays claim. The writer wishes it to be observed that, in the present communication, his remarks are confined exclusively to points which concern the merits of the Pharmacopœia; on another occasion he may discuss the question of its authority.

Before proceeding to the consideration of the remarks upon particular preparations, it may be proper to notice certain indirect criticisms upon the general execution of the work. The circumstance that alterations in the phraseology, nomenclature, and processes of the original Pharmacopœia are frequently introduced into the revised edition, appears to be a source of great discomfort to the editor of the Dispensatory. We find constantly recurring allusions to this circumstance, emphasised by notes of admiration, sometimes one, sometimes two or more, according to the degree of wonder the change may be supposed to have excited in the mind of the author. Sometimes the effect of this criticism by punctuation is increased by the parenthetical introduction of such phrases as the following: "the *Phil. Pharm.* has, *as usual*, modified," &c. with one point of admiration! "*According to custom*, the *Phil. Pharm.* has altered," &c. with two points of admiration!! "*A most admirable and simplified appellation*,"

&c. with three points!!! "The *Phil. Pharm. contrary to its usual custom,*" &c. with a single point! Now it is exceedingly difficult to answer this novel mode of annotation. The vagueness of the criticism affords no tangible object, and to endeavour to seize it is like grasping at a shadow. Still it is apparently the intention of all this contrivance to fix upon the revisers of the Pharmacopœia the charge of wanton trifling, of change for the love of change, without any adequate motive, and thus to depreciate the value of their labours. This then is the charge which it is deemed proper to meet. Had the author well considered the causes of the alterations to which he alludes? Did he recollect that even in his own estimation the original Pharmacopœia was far from perfect; and was improvement to be expected without change? Before indulging in this peculiar strain of animadversion, it would have been well had he perused the preface to the last edition of the Pharmacopœia, and, if not satisfied with the reasons there given for the course pursued, candidly stated his objections at once, and left the public to decide. In the opinion of the revisers, the work would have been imperfect without these alterations. The original edition was made up of portions taken from different Pharmacopœias, without any modification so as to make them harmonize, and fit well together as parts of one whole. To give unity to the work, it was necessary to reduce the discordant materials into order; and, a certain system having been adopted as the basis, every particular name and formula was made to conform with this system. It is obvious that in this process of consolidation, numerous changes were requisite, which, considered separately, might not seem to have been called for. The materials of an edifice may be severally well shaped, but if they do not fit accurately together, it will be necessary to remodel them, or the building would be awkward and unsafe. Besides, there were many errors of phraseology in the old work which required correction; and one source of numerous changes in the revision, was a mistake which had been inadvertently commit-

ted by the original framers of the Pharmacopœia, in converting the weights of the Edinburgh Pharmacopœia into the measures of their own. Other causes of change were the propriety of carrying into complete operation the system of nomenclature originally adopted, but not fully acted on in the first edition, and the absolute necessity of modifying certain names, so as to bring them into accordance with the present condition of chemical knowledge. Any one who will read with due attention the introduction to the last edition of the Pharmacopœia, and judge of any alterations which he may find by the principles there laid down, will not, in all probability be disposed to complain that they have been inconsiderately or wantonly made.

We now come to the more definite instances of criticism. The first is contained in the following paragraph, which relates to strong Acetic Acid.

"The *Phil. Pharm.* has the Dublin name and the same preparation, except that it employs acetat of *soda* instead of acetat of *potash*, which, although an alteration, is no improvement, since potash may be had where soda is unattainable. The proportions of the Dublin College are six ounces of the salt, and three ounces of sulphuric acid, which are followed by the *Phil. Pharm.* only in double amount." P. 12.

Passing over the inaccuracy in relation to the proportions employed by the Dublin College, which, according to the last edition of its Pharmacopœia are 100 parts of salt to 52 parts of acid, I cannot admit that soda is unattainable by any physician or apothecary in the United States. But the Pharmacopœia contemplates, that the acetate of soda will be procured from the chemical manufacturers, who can prepare it in quantities sufficient to meet any demand which may arise. In France and England, it is very largely prepared from pyroligneous acid by saturating this with lime, and decomposing the acetate of lime by sulphate of soda. Thus procured, it is much employed in the preparation of acetic acid, and at much less expense than

would be incurred by the use of acetate of potassa. Another advantage of the salt of soda is that its crystals are permanent in the air, while acetate of potassa is deliquescent. The former, therefore, always yields a definite product; the latter, if particular care be not taken, may at one time yield a stronger acid than at another. The process of the United States Pharmacopœia was tried experimentally before it was adopted.

On the subject of the Black Drop, the *acetum opii* of the old Pharmacopœia, the author observes:

"That of *Phil.* has rejected it, under the impression that it is 'unscientific in the directions, and uncertain in the result, and has been rendered unnecessary by the introduction of the acetate of morphia, and acetated tincture of opium;' all which is probably more a matter of opinion than of fact." P. 16.

How it is possible for any one to read the process, and not admit its uncertainty and want of science I cannot conceive. Certain quantities of opium, vinegar, nutmeg, and saffron are first directed to be taken and *boiled to a proper consistence.* Now is it possible for all persons to agree upon what is the proper consistence; and will not one almost necessarily boil more than another, and thus obtain a different result? Next, after the addition of sugar and yeast, the mixture is ordered to be digested for seven weeks, and placed in the open air until it becomes a syrup. Is the point at which a liquid becomes a syrup so obvious that no diversity of opinion can exist on the subject; and will different operators suspend the process at precisely the same moment of time, so that in every case the same amount of spontaneous evaporation shall occur? Again, is it scientific to boil the nutmeg when we well know that its virtues are dissipated by decoction? Independently of all this reasoning, it is notorious, among practical men, that the black drop is of uncertain strength, so much so that some consider it as possessing three times, others only twice the strength of laudanum. As its chief peculiarity is the substitution of an acetate for the natural meconate of morphia, the same end is obtained by the use of the separated acetate, or,

at any rate, of the acetated tincture, which contains all the active ingredients of opium; and these two preparations are now rapidly displacing the black drop. Indeed, the author seems to have changed his own opinion very shortly after penning the remarks which I have just quoted; for, on the next page but one, he refers for "some *good observations* on the subject of the black drop" to a paper by Thomas Evans in the second number of the first series of this Journal, of which paper the whole scope is to prove, that the black drop is unworthy of being considered officinal, and that an acetated tincture, such as has been introduced into the Pharmacopœia, should be substituted in its place.

The next criticism is on the subject of Rectified Ether. Appended to the process for this preparation is the following note.

"The *Pharm. of Phil.* orders these twelve ounces of ether, thus rectified, to be shaken with nine ounces of distilled water, from which, when the water subsides, the ether is to be poured and preserved. May we ask what is the object of this, and has the loss been taken into account of the ether that is dissolved by the water? And what can the water possibly remove that the solution of potash has not already done?"

In reply it is only necessary to observe, that the ether, as distilled from the solution of potassa, still contains a considerable proportion of alcohol, from which the operation in question is intended in some measure to free it. The following quotation from Turner's Chemistry bears upon the subject. "Ether combines with alcohol in every proportion, but is very sparingly soluble in water. When agitated with that fluid, the greater part separates on standing, a small quantity being retained, which imparts an ethereal odour to the water. *The ether so washed is very pure, because the water retains the alcohol with which it is mixed.*" The author of the criticism had only to open a work on chemistry to obtain an answer to his question. But whatever may be thought of the value of the direction, the London College should at least

share the credit or blame with the Washington convention; for the process of the United States Pharmacopœia is in all respects identical with theirs, and was, in fact, copied from it. The process for rectified ether given in the "American Dispensatory," was taken from a former edition of the London Pharmacopœia, before the direction for washing with water was introduced. Had the author consulted the last edition of that work, it may be a question whether, instead of the queries by which he insinuates a charge of ignorance against the convention, we should not have been presented with the very same direction, as an addition to the process which he has himself selected.

In relation to the Carbonate of Ammonia of the Pharmacopœia, the author observes: "As this salt possesses alkaline properties, it can scarcely be called carbonat; and it is rather surprising, that a term, which in the first edition of the Pharmacopœia, was deemed deserving of correction, conformably to all the three British colleges, should now be here revived!" P. 54. This criticism savours of the old school. Since the recent developments of the laws of chemical combination, the old nomenclature of salts, founded on an excess of acid or base as indicated by the predominance of its properties, has begun to be considered unphilosophical; and terms have been adopted which express the relative proportions of acid and base in equivalents. According to this system, the salt in question is a sesqui-carbonate of ammonia, consisting of three equivalents of acid and two of base. But a precise conformity with chemical nomenclature is not demanded in pharmaceutic titles, and as only one compound of carbonic acid and ammonia is employed in medicine in this country, there is no danger of confusion by designating it as the *carbonate of ammonia;* and the term in itself is preferable either to the sesqui-carbonate or subcarbonate, on account of its comparative brevity. The same plan has been adopted in other cases, and the change in this particular instance was in accordance with a general system of nomenclature. The name adopted by the Dublin

College in the last revision of their Pharmacopœia is the same with ours; so that in quoting this college as authority for the term "subcarbonate of ammonia," the author is himself in error.

The editor of the Dispensatory is not content with the process for Antimonial Wine. This subject has been fully considered in a previous communication; and the reader is referred to Vol. III. p. 201 of this Journal, for an account of the considerations which induced the convention to adopt the present formula, and which, in the opinion of the writer, justify the change. In relation to this process, I shall quote but a single sentence from the Dispensatory. "These remarks apply to the *Phil. Pharm.* whose prescription is a scruple of tartar emetic to ten ounces of wine, (☞ what kind?) whilst the *N. York Pharm.* retains, &c." P. 90. The author might have saved himself the trouble of asking what kind of wine was directed, if he had consulted the Materia Medica of the Pharmacopœia, in which "the white wine called Teneriffe" is expressly designated as the variety to be employed in all the processes in which wine is directed in that work.

In the preparation of the Nitrate of Silver, the Pharmacopœia directs one ounce of the metal and five fluidrachms of nitric acid. In relation to this the editor observes: "The *Pharm. Phil.* says *five* fluid drachms. This quantity is scarcely adequate to dissolve one ounce of the metal." Dr A. T. Thomson, in the London Dispensatory, states that "ten fluidrachms are amply sufficient for the solution of two ounces of silver;" and the acid to which he alludes has precisely the strength of that of the United States Pharmacopœia. The Dublin College at present directs 37 parts of silver to 60 of dilute nitric acid. The dilute nitric acid of this College has the sp. gr. 1280, and consequently contains about 48 parts of strong nitric acid of the sp. gr. 1.5, in the hundred. [*See Ure's table.*] As the acid of the United States Pharmacopœia is of the sp. gr. 1.5, it follows that 48 parts of it are contained in 100 of the Dublin dilute acid, or 28.8 in 60 parts,

so that the proportions of the Dublin College are 37 parts of silver to 28.8 of our nitric acid, or, in troy ounces, 1 to .7784. As a fluidounce of nitric acid (sp. gr. 1.5) weighs 1.424 troy ounces, it follows that .7784 troy ounces are equivalent to about four and a half fluidrachms, so that this is the quantity of the nitric acid of the United States Pharmacopœia directed by the Dublin College to dissolve an ounce of silver, considerably less than the quantity which the author of the Dispensatory pronounces to be insufficient. We are assured that, in the revision of the Dublin Pharmacopœia, care was taken to test the accuracy of the altered formulæ by actual experiment; and the probability is that they are generally correct. For their proportion of nitric acid, therefore, the convention have the authority of Dr Thomson and of the Dublin College; and a calculation founded on the combining numbers of the acid and metal, will lead to the same result.

The next remark which appears to merit particular attention, relates to Benzoic Acid. After copying the process of a former edition of the Dublin Pharmacopœia, the author goes on to say: "In this formula the *U. S.* and *N. York Pharm.* coincide. That of *Phil.* scarcely differs from it, except in verbal alterations, which rather obscure the process." P. 147. Now here is a grave charge. The convention is accused of altering a process, obviously for the mere purpose of change, and of having rendered it more obscure by the alteration. But what is the real state of the case? The process of the United States Pharmacopœia of 1820 was taken from the Dublin process of that time; but in the revision it was not considered sufficiently definite, and that of the London College was adopted in its place. The present process, therefore, so far from being a mere verbal change of the Dublin, is almost verbatim that of the London College; and the abandonment of the former process seems to be justified by the example of the Dublin College itself, which, long before the publication of the late edition of the American Dispensatory, had adopted a formula entirely different in all its steps from the one quoted, on its authority,

in that work. Writers generally admit, that the process which has been adopted in the United States Pharmacopœia from that of London, yields a larger product than the mode by precipitation; and though it is not so chemically pure, yet it is not on this account the less useful in a medical point of view, its fragrant odour, and, to a certain extent, its operation as a medicine, depending on the oleaginous matter mingled with the acid.

In allusion to Storax, the author observes: "The *Phil. Pharm.* has admitted this article, unduly, we think. The *N. York Pharm.* has omitted it. The former also directs its purification as below, *distilling off* the alcohol with a gentle heat; a very useless direction, to say the least." P. 148. The reason for admitting storax into the Pharmacopœia was, that it was a constituent of the compound tincture of benzoin, a preparation generally kept in the shops, and in considerable repute as a stimulant expectorant, and local application to indolent ulcers. If admitted into the Pharmacopœia, it was necessary that a process should be given for its purification, as in its ordinary state it is unfit for use. The process for purifying it consists in dissolving it in alcohol, then straining, and distilling off this liquid. But the author seems to have some objection to the distillation, which he considers useless, "to say the least;" in other words, it may, in his opinion, be injurious. It would have been satisfactory to have learned from him what injury could be incurred, as neither the London College, which gives the same direction, nor the Washington Convention, had any conception of the possibility of such a result. They even thought it might be advantageous to preserve the alcohol, as nothing rises from the storax which could contaminate this liquid at the temperature requisite for its distillation; and it is highly probable that the apothecary, unless better informed, may be of the same opinion.

Speaking of the process for procuring Muriate of Baryta from the carbonate, the author observes: "Why this was preferred to the sulphat we know not; certainly the carbonat of ba-

rytes is not so readily found in our shops for this purpose! It may be doubted if it could be had if wanted." P. 149. For the information of the author, it may be proper to state, both that the carbonate of baryta can be obtained in the shops, and that it was preferred to the sulphate for the preparation of the muriate, in consequence of the infinitely greater facility and simplicity of the process, which much more than outweigh any difference in the original cost of the article, at least on the small scale in which the muriate is prepared in the shops. Indeed, the author, on the following page, seems to have become of the same opinion; for he states, that "when the carbonat cannot be procured, the sulphat is employed to prepare the muriat, as follows;" that is, the sulphate is to be resorted to only when the carbonate is not to be had; and as there is not at present any absolute want of the latter salt, he will admit the propriety of the preference given to it in the Pharmacopœia.

The United States Pharmacopœia directs distilled water in the preparation of the "Liquor Calcis." The editor of the Dispensatory thinks this "might reasonably be supplied by the hydrant or rain water." P. 163. Were the Pharmacopœia intended exclusively for Philadelphia, it is undoubtedly true that the hydrant water might have been substituted for distilled water in the process; but the former is not to be obtained everywhere throughout the Union; and rain water, which is also proposed as a substitute, is apt to be contaminated with impurities from roofs, &c. and in dry weather is not always at the command of the apothecary. The common pump water, as found in many places, would be an altogether unfit ingredient of a preparation, one of the most common and useful applications of which is to allay irritability of stomach. Under these circumstances the convention can hardly be blamed for adopting distilled water as the solvent, especially as the greatest possible injury that can result is a little additional trouble.

The reintroduction of the Pulp of Cassia into the Confection

of Senna is deemed by the author "an *useless* change!" But when it is considered that this is, after senna, the most active ingredient, and certainly plays an important part in that modification which the senna undergoes in the preparation, the change may not be thought deserving of the character ascribed to it. In adopting the confection of senna of the London College, the framers of the first edition of the United States Pharmacopœia, unadvisedly, I think, omitted the cassia pulp, probably on the ground that it was not kept in our shops; but this objection to it is not valid, as our communication with the West Indies is so easy, that nothing more than a demand is necessary to lead to an abundant supply; and, in fact, since the publication of the Pharmacopœia, the cassia pods have once more made their appearance in the market.

On the subject of the Compound Confection of Catechu, consisting essentially of catechu, kino, opium and aromatics, the following remark is made. "The *Pharm. U. S.* and that of *Phil.* have not thought proper to employ it. It is, however, so good an article, that we are glad to find it introduced into the *N. York. Pharm.* under the name of Confectio Catechu." P. 250. The trouble of a reply to this criticism is spared us by the author himself in the very next page, where he observes: "With respect to the class of medicines now under notice, it may be affirmed, the smaller the number, the more perfect the Pharmacopœia." Again, "We must regret that the whole body of confections, conserves, and electuaries had not been rejected in toto!" The convention, though not prepared to go all lengths with the author, have acted in the spirit of his recommendation so far as they thought consistent with the interests of the profession; and, not finding the confection of catechu in the work, did not consider it as presenting claims sufficient to authorise its admission. It is, in fact, composed of ingredients which we are in the habit of associating in various proportions, according to the particular circumstances of each case; and it is, therefore, a more proper object for extemporaneous prescription, than for officinal direction.

I shall close these observations, for the present, by explaining one other error into which the editor of the Dispensatory has fallen, in relation to a process of the United States Pharmacopœia. After quoting a formula for the preparation of Compound Extract of Colocynth, as that of the London College, though it certainly is not the one at present recognised by that college, he proceeds as follows. "The *Pharm. Phil.* has a formula substantially the same, except that the amount of ingredients is increased to ounces. It has also added soap, but which of the two kinds mentioned in their list, is not stated. What the particular object of the soap may be in this preparation, we confess we cannot very well discern!" Now the fact is, that the process of the United States Pharmacopœia is in reality, what that given by Dr Coxe professes to be, the process of the London College. This College is responsible both for the increase of the proportions and the addition of soap; and, though the revisers of our own Pharmacopœia would very willingly bear the responsibility, they would be unwilling to assume the credit of the change, at least any other portion of it than what may be due to the perception of improvements, and a willingness to adopt them. In the preparation of an extract, so complex and so much used as that under consideration, the propriety of making it on a large scale is too obvious to require comment. The addition of soap may serve the double purpose of giving a more suitable consistence to the mass, and of qualifying the action of the aloes, so as to render it less disposed to produce irritation of the rectum. The author is mistaken in stating that the kind of soap employed is not designated. In the Materia Medica list two kinds are indicated, one by the name of "soap," defined to be "soap prepared from soda and olive oil;" the other "common soap," defined "soap prepared from soda and animal oil." In the formula for compound extract of colocynth the term "soap" is used, indicating, as plainly as words could indicate, the former variety. Is the note of admiration, with which the author closes the paragraph above quoted, intended

to express wonder at his own confessed want of discernment, or at the presumption of the convention in introducing an ingredient into one of their preparations, the use of which he could not discern?

Having followed the author so far as the "Extracts," I shall postpone any further investigation till another occasion. It may, however, be proper here to state, that I have not knowingly allowed any criticism which could bear unfavourably on the Pharmacopœia to pass unnoticed, and cannot therefore be obnoxious to the charge of shunning a full examination of any one point in relation to it. If there be errors in the work, they do not appear, so far as I have examined the Dispensatory, to have been detected. It is due to the author to state, that he has thus far, in at least two instances, given some credit to the revisers of the Pharmacopœia, viz. where he says that the dilution of carbonate of ammonia "has been with great propriety omitted in the *Phil. Pharm.*" P. 55; and that "the *Phil. Pharm.* very properly rejects that preparation [the process of Mr Phillips for preparing tartar emetic], and employs the above [the process for preparing the oxide of antimony from the muriate or chloride] as the first step in the process." P. 85. These instances of commendation, and they are the only ones which have particularly struck my attention, are here cited to show, that the object in this communication is not to do injustice to the editor of the Dispensatory, but purely to counteract unfavourable impressions in relation to the Pharmacopœia which his mistaken criticisms, if not corrected, might be apt to produce.

[To be continued.]

Article XVI.—*On Arsenic. By J. K. Mitchell, M.D. and Elias Durand, M.P.*

As a poison and a medicine, arsenic is a substance of considerable importance. Not unfrequently applied to the treatment of diseases, and too often used for the destruction of individuals, this metal has been a subject of much scientific investigation. But, as we shall see in the course of this memoir, although the knowledge which we possess concerning it has been sanctioned by authority and declared under frequent attestation in courts of law, yet there is perhaps no part of science less entitled to our credence or respect. The detection of some errors which have the countenance of high and almost universal authority, led us to investigate in detail the most important characters of arsenic.

The specific gravity of regulus of arsenic is, according to Bergman, Thenard and Henry, 8.31, and that weight is sanctioned by Paris and Fonblanque. Brandt, followed by Christison, makes it 8.308. Lavoisier found it *when melted?* 5.7633; Harepath, 5.672; Berzelius, 5.7; Guibourt, 5.959; Turner, 5.8843; and Thomson, when sublimed, 5.235. We obtained *by sublimation* in a clear glass tube a ring of arsenic of very remarkable brilliancy. From that ring was removed the upper part, which looked duller, and then by a very delicate hydrostatic balance we found the specific gravity to be 5.767. The number given by Lavoisier and Berzelius is that which approaches therefore most closely to the truth.

The specific gravity of the white oxide (arsenious acid) is subject to nearly equal variety of statement. According to Bergman it weighs, when vitrified, 5.000, while Dr Wollaston makes it in that state 3.699, and R. Phillips, 3.715. In its ordinary state it is 3.706 (Bergman), or 3.729 (Harepath), or 3.260 (R. Phillips). By very carefully conducted examination we fix the specific gravity of compact opaque arsenious acid at 3.656, and that of the transparent variety at from 3.208

to 3.333; and no specimen weighed more than 3.4. When it cracks, as it does in its progress to a perfectly opaque condition, its specific gravity must necessarily vary with every specimen. Dr Wollaston's number for the vitrified specimens, represents nearly also the sp. gr. of compact opaque arsenic as we found it.

The metal itself has been *universally* represented as the most volatile of metals. Bergman, Thenard and Berzelius fix its subliming heat at or about 324° F.; Christison at 356°; and Paris and Fonblanque 540°. In a criticism on the work of Paris and Fonblanque, in the Edin. Med. and Surg. Journ. the writer observes that "all the best modern authorities state it to be only 356° F.; and no chemist, so far as we know, has fixed it higher than 388°."*

The vaporising temperature of white oxide, stated by Thomson, Bergman and Christison at from 351° to 383°, is fixed by Berzelius and Thenard at or near incipient red heat. Generally the first authorities consider the metal as more volatile than the arsenious acid.

Having observed that the metallic arsenic always occupied the part of the glass tube nearest to the flame, while the arsenious acid formed during the process of reduction, or which escaped unaltered, concreted on a part considerably higher up, we naturally inferred that metallic arsenic is less volatile than arsenious acid. To satisfy ourselves we performed the following experiments.

Into two tubes, *open at one end* and sealed and blown into a bulb at the other, were put equal quantities of metallic arsenic and white oxide respectively. These bulbs, and that of a good Fahrenheit's thermometer, were immersed in cold linseed oil, so as not to touch the bottom of the vessel, and a spirit lamp being placed beneath, heat was gradually applied. At 425°, by two experiments, the arsenious acid became visible on the sides of the tubes at a point about one-fourth of an inch above the surface of the oil. In the tube containing the metal

* In the Dic. de Chimie of Klaproth and Wolff, it is said to be volatile in close vessels at 540° F.

the quantity of oxide seemed much smaller than in the other. At 560°, no metallic arsenic or black oxide being visible, the process was closed, on account of the insufferable fumes from the oil.

Mercury being substituted for the oil, other similarly prepared tubes were immersed in it, heat applied, and the same results obtained.

Mercury being made to boil briskly, the bulb of a thin glass tube containing bright arsenic was suddenly immersed in it, with the effect of producing a little sublimed arsenious acid; *but no metal was sublimed.*

Into zinc just fused was plunged a similar tube, with the effect of producing some arsenious acid and an umber ring; but no bright arsenic was sublimed.

As the zinc declined in temperature, and was just about to lose its fluidity, two other tubes containing arsenic were plunged into it. Neither sub-oxide nor metal was elevated, but as usual some crystals of white oxide were observed.

Into a glass tube, partially imbedded in a crucible full of sand, and heated to visible redness, was dropt a small piece of bright arsenic just *at the moment* when, in the dark, the imbedded part of the tube ceased to be luminous. No metal was sublimed.

The same experiment being in progress, the metal was thrown in, while the redness at the bottom of the tube was distinctly visible in the dark. A very little metal sublimed.

These experiments conclusively demonstrate that the temperature at which arsenic is volatilized, is a *red heat visible in the dark*, a degree of heat nearly twice as great as has been supposed by the author who rates it the highest. They also show that the point of sublimation of arsenious acid, is higher than stated in most treatises, but not nearly so high as indicated by Berzelius and Thenard, and greatly below the subliming temperature of the metal itself.

The taste of arsenious acid is said by Bergman to be acid subdulcid. Hahneman, Dr James Gordon and Walker think it sweet. Addington and Christison esteem it insipid; while

Zacchius, Orfila, Berzelius, Foderé, &c. declare it to be sharp and acrid. In truth, when in a strong hot solution, the taste is, as described by Navier, rough, while in powder or in the common cold solutions, it excites a sensation on very delicate palates only, and that is too feeble to be distinct or susceptible of description. When most perceptible, it is most nearly like that produced by sulphate of zinc.

The odour of garlic or the arsenical odour was formerly ascribed to the arsenious acid, but is now universally attributed to the vapour of the uncombined metal. As the odour can be perceived when arsenic is placed on the surface of boiling mercury, a temperature at which no metal is volatilized, and as the unreduced white arsenic is entirely inodorous, we are left at some loss to detect the cause of the odour. But as the temperature is about that at which is formed the brown oxide (suboxide of Berzelius), the odour may *by inference* be attributed to that; so that on this point, also, both the older and more recent writers are probably in error.

The solubility of arsenious acid is a point not uninteresting both to the physician and toxicologist, but it is particularly recommended to the attention of the pharmacopolist because of the peculiarities attending it. Klaproth and Bucholz found that 1000 parts of temperate water take up two and a-half parts, while 1000 parts of boiling water dissolve 77.75 parts or one 13th, and retain on cooling 30 parts or one 33d of their weight. Fischer of Breslau totally denies the solubility of white arsenic, while Guibourt pretends to have discovered that vitrified or transparent arsenic is less soluble than the opaque varieties. He dissolved in 1000 parts of temperate water 9.6 parts of transparent, and 12.5 of opaque arsenic, while, when boiled, the same quantity of water dissolved 97 parts of the first, and 115 of the second, retaining at 60° F. 18 of the one and 29 of the other. To settle this point we made the following experiments.

Cold Solutions.—1. Levigated opaque arsenic in water at 60° F. for half an hour; filtered and ascertained the specific gravity of the liquid to be 1001 grains, water being 1000 grains at 60° in the same bottle.

2. Repeated—result 1001.

3. Repeated with recent transparent variety—result 1008½?.

4. Repeated with opaque variety—result 1001¾.

5. A perfectly transparent specimen levigated, left for 48 hours and occasionally agitated, had after filtration a sp. gr. of 1012¼ grains, and yielded when evaporated to dryness 15¼ grains of white arsenic.

6. Treated an opaque variety in same way for 24 hours—result 1009; this was in a wide shallow dish.

7. Treated same kind for some time in same way in a tall narrow phial, which was often shaken—result 1006.

The solution No. 7 was subsequently thrown on powdered arsenious acid in a wide dish and left for 48 hours—result 1011½.

Remarks.—The effect of time on the action of the solvent is worthy of notice, as it may be found hereafter to affect other solutions in the same unlooked for manner. We perceive in the above experiments no confirmation of the assertions of Guibourt, for we discover a greater rapidity and equal extent of solubility in the transparent variety when placed in similar circumstances. The shape of the vessel appears also to exert some influence.

Hot Solutions.—1. Powder of compact opaque arsenious acid of sp. gr. 3.656, was subjected to water in active ebullition for two hours, when the sp. gr. while hot was found to be 1015¼ grains; water of same bulk and temperature being 967 grains.

2. Same quantity of a much finer and older powder subjected to exactly the same treatment—result 1033.

3. Same treatment with powdered compact opaque variety for four hours—result 1049½.

4. Same treatment with the same kind for four hours, filtered while hot, and reduced until the sp. gr. was 1062. As this solution contained about the quantity of arsenic in Guibourt's strongest solution, it was left in a temperature of 60° for 48 hours, when its sp. gr. had become 1021½.

5. A boiling solution of sp. gr. 1042, reduced rapidly to 60° F. filtered and weighed—result, at 60°, 1029½.

6. A solution reduced by boiling until deposits began, and allowed to cool and left for 16 hours—result, at 60°, 1033. Actual weight of arsenic in the cold solution was found by evaporation to be 39 grains.

7. Seven drachms of finely powdered old opaque arsenic were boiled in water for five hours, the liquid being filtered was reduced to one half, at which time a pellicle began to form, and the temperature rose to 216° F. Sp. gr. while hot 1076½. That weight was then transferred to an evaporating dish, carefully evaporated, and 138¼ grains of white arsenic obtained. 1000 grains of water of same temperature would therefore dissolve 147.6 of arsenic.

8. By exactly the same procedure with a compact semi-transparent variety, the sp. gr. bottle held of the hot liquid 1077 grains, which yielded on evaporation 139¾ grains. 1000 grains would therefore hold in solution 148 grains.

Remarks.—The power of the solvent in a given time, depends rather on the fineness of the powder than the variety from which obtained. A truly saturated boiling solution holds about 15 per cent, or nearly 1 to 6.75. But such a solution does not seem attainable by mere ebullition without evaporation, which will account for the discordancy in the statements of authors on this subject.

The maximum power of water at 60° F. is the dissolution by 1000 grains of about 16 grains of the arsenious acid, though water at 60° is capable of holding about 40 grains; but the amount deposited during refrigeration depends so much on time and some unknown agents as to constantly vary the results.

TABLE OF COMPARISON.

Hitherto stated by authors.	*Now stated.*
Sp. gr. of metal from 5.235 to 8.31,	5.767.
of white arsenic from 3.260 to 5.000,	3.656.
Temperature at which the metal rises, 324° to 540° F.	Red heat visible in the dark.

Hitherto stated by authors.	*Now stated.*
Temp. at which white arsenic rises, — From 351° to low red heat	425° Fahr.
Taste of white arsenic—acrid, insipid, sweet, acid, rough.	Tasteless in mass, scarcely tasted in powder or cold solution; austere in strong hot solution. Neither sweet nor sour in any case.
The alliaceous odour comes from white oxide only—from metal only.	Probably only from suboxide.
Solubility of arsenious acid, — Cold, 2½ parts in 1000. No solubility. 9.6 and 12.5 in 1000 according to variety.	From 12 to 16 grains in 1000, without distinction of variety.
Solubility of arsenious acid, — Hot, 1000 dissolve 77.75, or 97 to 115, and retain on cooling 30, or from 18 to 29, according to specimen.	1000 grs. of boiling water will hold when saturated 148 grains of white arsenic, and retain from 25 to 40 on cooling, being affected by time, &c. and not by variety.

[To be continued.]

Article XVII.—*On Certain Compounds of Carburetted Hydrogen. By Daniel B. Smith.*

It is often serviceable to the cause of science to bring together facts of the same general character, even where no new discovery or investigation is attempted. Analogies are often thus suggested, to guide the experimenter or the theorist; for we do not always perceive the resemblance which isolated facts bear to each other, or the importance of the class to which they belong, without this sort of aid. It is therefore hoped, that a view of the part which the carburet of hydrogen plays in chemical combination, will not be altogether useless.

There are two combinations of carbon and hydrogen identical in their proportions, yet having different properties. The first, which is the olefiant gas of the Dutch chemists (the di-

hydric carburet of Berzelius), contains two volumes of gaseous carbon, and two of hydrogen gas condensed into one; and consists of two proportionals of carbon, and two proportionals of hydrogen, its atomic weight being 14. Its specific gravity is .9722 (.9852 according to Saussure), it is not acted upon by any of the acids, and is a permanently elastic fluid.

The second, which was discovered by Faraday, and is the tetarto-carbo-hydrogen of Dr Thomson, contains four volumes of gaseous carbon, and four volumes of hydrogen gas condensed into one, and consists of four proportionals of each; its atomic weight being 28. Its specific gravity is 1.944; water absorbs it sparingly; alcohol takes it up in large quantities, and sulphuric acid absorbs more than 100 times its volume of the vapour. On being cooled to zero it becomes a liquid, having the specific gravity of .627. This remarkable difference is, no doubt, owing to a different arrangement of particles; the integrant molecules of the former being each composed of four simple atoms arranged round each other, and those of the latter of eight, having also a peculiar arrangement. It is probable, that in the nascent state these compounds are readily substituted for each other.

These sub-species or varieties of carburetted hydrogen, may be regarded as bases, forming by their combinations with other substances a very peculiar and strongly marked class of compounds. The first combination is the hydrate of di-hydrocarbon, formed of one equivalent of olefiant gas, and one of water. This neutral compound is *alcohol.*

The second is the hydrate of tetarto-hydro-carbon, formed of one equivalent of Faraday's carburet, and one of water. This compound is the hydric ether, which is known by the name of sulphuric, phosphoric or arsenical ether, according as it has been prepared with those acids respectively.

This hydric ether is usually considered as the type of its class, and its properties are too familiar to need description.

Carburetted hydrogen combines with the acidifying principles chlorine, bromine, iodine, and with cyanogen, forming

with them ethers which may be classed together as the second division of the order.

Chloride of Hydro-carbon.—The character of this species of ether is involved in some confusion, as the accounts of different authors are somewhat at variance. Three varieties have been described, which a more close examination will probably reduce to a single species. Analogy would lead us to anticipate that this will prove to be a chloride of tetarto-hydro-carbon. The first species is formed of one volume of chlorine and one of olefiant gas, and is the ether discovered by the Dutch chemists, and termed "la liqueur des Hollandais" by French writers. It is a compound of one atom of each of its elements, and its atomic number is 50. It is a colourless volatile liquid of a peculiar sweetish taste and etherial odour. Its specific gravity is 1.2201. It boils at 152° F. and may be distilled without change.

When a stream of chlorine is passed through alcohol or sulphuric ether till these liquids are saturated, a peculiar ether is formed, having, according to Vogel, a specific gravity of 1.134. It is a colourless, thin, oily looking fluid, more volatile than water, smelling somewhat like nitrous ether, and having a hot, aromatic and somewhat bitter taste. It is scarcely soluble in water, but dissolves in alcohol and sulphuric ether in all proportions. Depretz considers it as composed of one volume of chlorine and two of olefiant gas. It is probably a mixture of chloric and hydro-chloric ethers.

A third species of chloric ether is formed by distilling alcohol from chloride of lime. It resembles the first species, but has been analysed by its discoverer Soubeiran, who has ascertained it to be a compound of two proportions of chlorine, two of hydrogen, and one of carbon: or two atoms of chlorine and one of bi-hydroguret of carbon. A self-taught American chemist* on the shores of Lake Erie, has the credit of first insulating this very curious and interesting species of ether.

* See several communications on the subject of this ether in 21st and 22d vols. of Silliman's Journal, by S. Guthrie of Sacketts Harbour.

Soubeiran obtained it by distilling one part of alcohol at 33° with thirty-two parts of liquid chloride of lime, made of one part of solid chloride to five of water. The receiver was surrounded by cold water, and the retort heated till the liquid began to boil. The fire was then removed, and the distillation continued of itself until no more ether passed over. By repeated washings and distillations (the last one from muriate of lime), the ether was obtained in a highly concentrated state. This liquid, as obtained by Soubeiran, was heavier than water. It boils at 190°, is colourless and very limpid, has a very sweet and penetrating odour, and a hot, aromatic, saccharine taste. Its vapour when breathed excites a decided sensation of sweetness in the fauces. It is slightly soluble in water, to which it communicates a saccharine taste. Alcohol unites with it in all proportions, and forms, when sufficiently diluted, a very agreeable aromatic and saccharine liquor.

It remained in contact with a solution of nitrate of silver for a month, without decomposition. Neither sulphuric, nitric, nor hydro-chloric acids act upon it. When mixed with alcohol and a concentrated solution of potassa, and slightly heated, a rapid decomposition ensues; chloride of potassium is formed, and a volatile oily liquid separates, having a yellow colour and the smell of cummin. While Soubeiran was making these researches in Europe, the subject was engaging the attention, in a ruder manner to be sure, of Guthrie in this country.

He obtained an etherial spirit by mixing three pounds of chloride of lime and two gallons of alcohol, sp. gr. .844, in a retort, and distilling about one gallon. By redistilling this product in a glass retort, from a great excess of chloride a highly concentrated ether was obtained, weighing 1.44. When the final rectification of the ether was performed, by distilling it from strong sulphuric acid, it was obtained of the sp. gr. of 1.486. In this state it boils at 166°, is extremely volatile at 60°, and diffuses upon the tongue and fauces a powerful etherial odour, and excites to an intense degree its peculiar scent and aromatic taste. The action of sulphuric

acid upon the alcoholic solution is peculiar; it diffuses itself through and blackens the whole mass, and generates sulphuric ether after the chloric ether has distilled over. If no alcohol be present, the transparency of the liquid is not affected.

The action of this ether upon the living system is interesting, and may hereafter render it an object of importance in commerce. Its flavour is delicious, and its intoxicating qualities equal to, or surpassing those of alcohol. It is a strong diffusible stimulus, similar to the hydrated ether, but more grateful to the taste.

Bromide of Hydro-carbon. Bromic Ether.—This ether is colourless, transparent, heavier than water, has a strong etherial smell, a sharp taste, and is very volatile. It is soluble in alcohol, from which it is precipitated by water.

Iodide of Hydro-carbon. Iodic Ether.—Iodic ether is perfectly neutral. Its odour is strong, and though peculiar, is analogous to that of other ethers. Its sp. gr. at 72° is 1.9206. It boils at 148½°. It is not inflammable, but merely gives out purple vapours when put upon burning coals.

Sulpho-cyanide of Hydro-carbon. Sulpho-cyanic Ether.—This ether is an oily fluid, heavier than water. It has a strong smell of assafœtida or cochlearia officinalis, a sweetish taste, and leaves an impression of peppermint in the mouth. It is very soluble in alcohol and hydric ether. It burns readily and gives out fumes of sulphurous acid. It begins to boil at 151°, but the boiling point rises to 161°. Potassium preserves its lustre in it for some time.

A third class of ethers is formed by the union of hydro-carbon with an acid. These combinations are perfectly neutral, and have all the characters of genuine ethers. The neutrality of their elements is, however, easily disturbed.

Hydro-chlorate of Hydro-carbon. Hydro-chloric or Muriatic Ether.—Muriatic ether is a colourless gas, having a strong etherial smell and a sweetish taste. It is perfectly neutral; its sp. gr. is 2.219. At the temperature of 52° it condenses into a colourless liquid ether, the sp. gr. of which

is .874. It is more volatile than even the hydric ether. It exhibits no acid properties, and burns readily with a green coloured flame. It is composed of two volumes of olefiant gas, and one of hydro-chloric acid condensed into two volumes. It contains no water.

Sulphate of Hydro-carbon. Sulphuric Ether. Oil of Wine.—There can be no doubt, that the liquid known by the name of oil of wine, is a genuine ether of this class. The pre-occupation of the name sulphuric ether, by a substance in no way entitled to it, is probably the reason why it has not hitherto been so classed. The circumstance is an illustration of the effects of a false nomenclature in obstructing the progress of science.

Oil of wine has been proved to be a compound of two atoms of sulphuric acid and two atoms of tetarto-hydro-carbon. It is an oily liquid of a light amber colour, a fragrant smell, a bitterish, pungent taste, and a sp. gr. of 1.06. It does not mix with ether, but combines with alcohol and produces no change on vegetable blues.

Hydrated Hypo-nitrite of Hydro-carbon. Nitrous Ether.—This ether is a compound of one atom of tetarto-hydro-carbon, one of hypo-nitrous acid, and one of water. It has a pale straw colour, a strong peculiar etherial odour and sweet taste, and is more volatile than hydric ether. Its sp. gr. is .85, that of its vapour 2.627. It dissolves in forty-eight parts of water, communicating an odour like that of apples. It is perfectly neutral, dissolves in alcohol in every proportion, and burns with a brilliant white flame.

Hydrated Oxalate of Hydro-carbon. Oxalic Ether.—This ether is composed of one atom of tetarto-hydro-carbon, one of oxalic acid, and one of water. Its sp. gr. is 1.0929, and that of its vapour 5.087. It is an oleaginous liquid, having an aromatic smell, somewhat analogous to that of garlic or phosphorus. It boils at 263°.

Hydrated Acetate of Hydro-carbon. Acetic Ether.—This ether is composed of one atom of acid, one of tetarto-hydro-

carbon, and one of water. It is a limpid, colourless fluid, with a pleasant etherial odour. It does not redden vegetable blues. Its specific gravity is .882, and its boiling point 165°. It is soluble in hydric ether and alcohol. It burns with a yellowish white flame, and dissolves in seven parts of water at 62°.

Hydrated Benzoate of Hydro-carbon. Benzoic Ether.—This ether is composed of one atom of tetarto-hydro-carbon, one of acid, and one of water. It is a colourless oily looking fluid, with a pungent taste and a weak smell, somewhat resembling benzoic acid. Its sp. gr. is 1.0539, and its boiling point 408°.

The following ethers have not been subjected to analysis, but there is every reason to suppose that their composition is similar to that of the other acid ethers.

Formic Ether.—This ether is a colourless fluid, having a strong smell of peach kernels. Its sp. gr. is .9157, and its boiling point 133°. It burns with a bluish white flame, dissolves readily in alcohol, and in nine parts of water at 55°.

Tartaric Ether, Citric Ether, Kinic Ether, and Malic Ether.—These ethers have not been obtained pure, and little is known of their properties. They appear to be neutral compounds of their respective acids with the hydro-carbon as a base. They are destitute of smell and volatility, are heavier than water, and very soluble in alcohol.

Farther researches will probably extend this class of compounds, which is marked by characters as peculiar as those belonging to the acids, the alkalies, the salts, or any other of the great divisions into which compounded bodies may be thrown.

There is another substance, the properties of which are so strongly marked, that if its composition were unknown, we should not hesitate to rank it among the ethers as one of the best defined of the class. I mean the *bi-sulphuret of carbon* This is a transparent, colourless liquid, with an acid, pungent, and somewhat aromatic taste, and a very fetid odour. It is exceedingly volatile; its sp. gr. is 1.272, and its boiling point

110°. It burns with a pale blue flame, dissolves readily in alcohol and ether, and is insoluble in water.

Is this analogy sufficiently strong to warrant the conjecture, that sulphur is a compound of hydrogen and an unknown radical, and that the "alcohol of sulphur" is a true ether, composed of this radical and hydro-carbon?

Article XVIII.—*Pharmaceutical Notices, No.* 4.

Morphia. Twelve pounds of opium were digested in six gallons of clean rain water for three days, when two quarts of yeast were added, and the whole subjected to the heat of a stove 90° F. for seven days; the mixture was turbid, and after vainly endeavouring to filter it, I was obliged to clarify it with the whites of eggs, employed as in the manufacture of syrup; by this means I obtained a clear solution. The colouring matter was precipitated in the usual way, by very cautiously dropping dilute ammonia into the solution, as long as a blackish brown precipitate was thrown down, and when the colour changed to a light fawn colour, the solution was filtered and precipitated by ammonia in excess, giving a precipitate which was but slightly coloured. The solution was then saturated with sulphuric acid, evaporated to one half, and again precipitated by ammonia, added, as at first, very cautiously, so, as at first, to throw down the colouring matter, then filtered and again precipitated by ammonia; this process was continued as long as a drop of the decanted solution, when evaporated to dryness on a piece of glass, was reddened on the addition of nitric acid. The precipitates were dissolved in dilute sulphuric acid, and the solution filtered through depurated animal charcoal, (prepared by dissolving the phosphate of lime in bone-black by muriatic acid, calcining the residuary charcoal with potassa

and washing the product, until the washings no longer precipitated muriate of platinum), and carefully evaporated, when beautifully crystallized sulphate of morphia was formed at two successive times, after which the mother liquor became coloured, and was consequently acidulated with sulphuric acid, and again filtered through charcoal, evaporated and crystallized. I obtained from 12 pounds of opium, 11 ounces 124 grains of sulphate of morphia. I have never failed in obtaining, in the small way, 40 grains of pure morphia from 500 grains of opium; but when I have operated on pounds, I have never obtained more than two-thirds that proportion; this I conceive to arise from the fact, that an ounce of opium cannot be obtained, that will be a fair representative of a few pounds of the same parcel.

Iodides of Mercury. The remark made by the editor of the Journal of the Philadelphia College of Pharmacy, although supported by the authority of Dumas, is, in my opinion, not the less incorrect, and I will prove it from Dumas himself. In Vol. III. pages 618, 619, paragraph 2250, this author observes: "Red *Iodide.* This remarkable compound may be obtained, in a direct manner, by triturating mercury with an excess of iodine, and washing the mass *with alcohol* to remove the uncombined iodine." Again (page 619), he says: "the red iodide is soluble in alcohol." Now it is evident that there must be an error somewhere; for if alcohol is to be used to remove the uncombined iodine, the inference must be, that this fluid will not act on the iodide of mercury. Now I find that alcohol at 0.822 does not dissolve any one of the iodides of mercury, and that heating the red iodide converts it into a red and yellow sublimate, the yellow being pressed turns red, and being heated with alcohol is again changed to a yellow: what is the legitimate deduction? that the yellow and red iodides are identical. Dumas also describes a green iodide of mercury, which, when sublimed, will form both the yellow and red iodides, and by trituration will form the red only; it is merely necessary to heat the yellow, when, without loss of

weight, it will become red. Thomson, in his last work, has two iodides which he quotes from Gay Lussac, but without telling us where this author states it as a fact. Dumas has evidently some hypothetical notions on this subject, for he says, in the precipitation of the iodides of mercury, that the precipitate is green when the salt is neuter, that it is yellow when the salt is somewhat acid, that when there is more acid present it is red, and when this is in excess, both uncombined iodine and the red iodide appear together. I may ask why I cannot dissolve the red iodide from the yellow by alcohol at 0.822.*

Indelible Ink. The solution of nitrate of silver is sometimes accidentally spilled upon linen, &c. and but few persons are capable of removing the stain. The following process will always succeed. Take three tumblers: into one of which are to be put muriatic and nitric acids in the proportion of one part of the former to one half of the latter and four parts water; the second tumbler is to contain dilute aqueous ammonia; and the third pure water. The stained spot is to be im-

* Our ingenious correspondent has certainly made a good defence of his original supposition, and has exposed a discrepancy in the account given by Dumas of the effects of alcohol on the red iodide; at the same time, he has failed in convincing us of the identity of the different iodides. Berzelius, than whom there can be no higher authority, admits three of these compounds, *iodure mercureux* (green iodide, D.); *iodure susmercureux* (yellow iodide, D.); and *iodure mercurique* (red iodide, D.). Of the latter, he says: "this is precipitated in the form of a scarlet powder, when a solution of iodide of potassium is mixed with a mercurial salt; it is readily fused, and then becomes yellow; it sublimes in rhomboidal laminæ, which are at first yellow, and become red on cooling. If a tolerably large quantity be sublimed, pretty large groups of crystals will be obtained of a sulphur yellow colour, which, according to Hayes, do not change colour from the action of the air, even when exposed to the solar rays; but, if they be scratched with a fine point, or forcibly compressed, they become red, the change beginning at the spot acted upon, and soon extending to every portion of the crystals. The *iodure mercurique* is soluble in alcohol and the acids, especially by the aid of heat, and crystallizes on the cooling of the solution." From the mode pursued by our correspondent, it is likely that the compound he obtained was the iodide of mercury (green iodide), as this is the method advised by Berthemot for its preparation. This iodide becomes red by the effects of heat, and is insoluble in alcohol.—Ed.

mersed in the acid mixture for a few seconds, and then rinsed in the water, afterwards dipped in the alkaline solution and then in the water, and so on successively until the object is attained; about two immersions as above will remove the deepest stain of what is generally termed *indelible ink.*

A.

ARTICLE XIX.—*Observations upon the Ol. Euphorbiæ lathyris. By Jos. Scattergood.*

The *Euphorbia lathyris* is a monoecious plant indigenous to France. It is commonly known by the name of Caper Spurge and Mole Plant, it being supposed that no moles disturb the ground where it grows. Although not a native of this country; according to Barton, it is sometimes met with in this neighbourhood in situations where it has the appearance of growing wild. It is easily cultivated, and in some parts of New Jersey, where it has been introduced, is found in abundance.

Like all the Euphorbiaceæ, it contains a milky acrid caustic juice. It is stated in the "Manual of Materia Medica and Pharmacy," by Edwards and Vauvasseur, translated by Durand and Togno, that the country people in France have been for a long time in the habit of using the fresh leaves and roots of the plant, in order to obtain copious alvine evacuations. The seeds or beans are emetic and cathartic, in doses of from two to eight grains. They weigh, when decorticated, from two to three grains.

The oil obtained from them, which in France is called Catapucia oil (Oleum Catapuciæ Minoris) resembles in colour the Ol. Ricini; it is, however, less dense; has no odour when freshly prepared, and no perceptible taste. It is soluble in

sulphuric ether; insoluble in alcohol; forms a soap with the alkalies; and burns with a fine white flame; its sp. gr. is 92°. The process by which Thomas Bellangee, of Crosswicks, New Jersey, (the only manufacturer of it in the United States) obtains it, is precisely similar to that used in obtaining the Ol. Ricini. It yields about fifty per cent.

Dr Charles Calderini first obtained and used it. It is stated, on his and Dr Frank's authority, that its effects are sure and prompt. "We ought," says the Italian author, "to consider it as a very mild purgative; it does not produce vomiting, nor colic, nor tenesmus; it may even be administered in dysenteries, where there is intestinal irritation, with as much advantage as the pulp of tamarinds."

It is well known that soil and situation exercise a material influence upon the medicinal properties of plants, and it may possibly be owing to this cause that the oil obtained from the beans grown in this country, does not possess the mild properties attributed to the European article.

Doses of six, eight, ten and twelve drops were given to several individuals, with a view of producing cathartic effects; and, although administered in conjunction with aromatic oils, and in one or two cases with an alkali in the form of soap, it invariably produced excessive nausea, and even vomiting. In some instances, it did not produce alvine evacuations, and in others, both vomiting and purging ensued. In all of these cases the whole dose was administered at once. I have been informed by the manufacturer, that when administered in small quantities, and repeated at intervals of half an hour or an hour, it operates on the bowels freely as a cathartic, without producing much nausea. It is, however, to be feared, that without some method can be devised, by which its nauseating property may be avoided, this disagreeable effect will prove an insuperable objection to its general use, at least as a cathartic.

A few weeks since, I found about half an ounce of a crystalline matter in the bottle in which about four pounds of the oil had been kept for five or six months. The form of the crystals

could not be satisfactorily ascertained. When freed from the oil, which was readily done by treating them with cold sulphuric ether, they were white, slightly soluble in cold, but very soluble in boiling ether. Cold alcohol does not dissolve them: they are soluble in boiling alcohol, but not so much so as in ether. From both these they are precipitated, upon cooling, in acicular crystals. They have little or no taste or smell. When exposed to heat, they melt; the fluid resulting, resembles the oil: if the heat is not too great, a crystalline mass is formed on its cooling. It imparts a slight milkiness to water when boiled with it. Nitric or muriatic acids have no effect upon it, either hot or cold. It dissolves in sulphuric acid, producing a bright red solution, which, after standing some time, changes to black. Its action upon the system, so far as could be ascertained, appeared to be similar to that of the oil, although in one or two cases it exhibited symptoms of more virulence. The experiments on this point, however, were, for want of proper subjects, far from being satisfactory.

My efforts to obtain this resinous substance directly from the seeds, have proved ineffectual, although several methods were tried.

The medicinal virtues of the plants of the family to which this belongs, are extremely interesting; and it is to be hoped professional men and others will embrace every opportunity to develope and render them useful.

SELECTED ARTICLES.

Article XX.—*New Experiments on Bitter Almonds and their Essential Oil. By MM. Robiquet and Boutron Charlard.*

[Concluded from page 75.]

After having executed this preliminary examination, which was only meant to afford some definite data, we returned to our principal object, which was the study of the essential oil; but not being willing to operate on any but very pure products, we were obliged to occupy ourselves with the means of readily obtaining this oil; now it is well known that nothing is more difficult with the ordinary apparatus, because powdered almonds mixed with water form so thick a paste, and the liquid becomes so viscous, that it is almost impossible to subject it to ebullition for a few minutes, without its puffing up or adhering to the sides of the vessel, and consequently being decomposed. Among the various means to which we had recourse, we found the employment of steam the most advantageous.* If, in fact, we divide the products obtained by this

* We constructed a particular apparatus, composed

1. Of a steam boiler.

2. Of an ordinary still, the cucurbit of which is furnished towards its inferior part, and at some distance from the bottom, with a thick tube forming a cross, which is perforated at its superior surface with a great number of small holes. This tube is closed at three of its extremities, and its fourth traverses the sides of the cucurbit, and is adapted to the boiler.

means, it will be found, that the first contains more oil, and that the supernatant liquid is limpid; while at a more advanced part of the distillation, the oil is in less proportion, and nevertheless the liquid becomes very milky; finally, no more oil is obtained, and the liquid again becomes clear. If we examine those three successive products, we find that they have not any action, on either blue or red test paper.

M. Vogel was therefore in error in stating that the distilled water of bitter almonds was acid; it does not manifest this character, except when it has undergone some alteration. The odour of the first products is so strong and penetrating, that it resembles rather that of cyanogen than the mild smell of hydro-cyanic acid; and what is more remarkable, is, that if we make a comparative examination of the three products, by the salts of iron, we recognize, not only that the cyanic compound contained in this water diminishes as the distillation advances, but that this compound, whatever it may be, must rather contain cyanogen than hydro-cyanic acid, since the precipitates we obtained, even with the per-salts of iron, are

3. At the opposite side and at the lowest part of the cucurbit, is a cock, for the purpose of drawing off the condensed water.

4. The water bath of this still, instead of having close sides, as usual, is to be constructed of tinned brass wire, connected by several bands of copper, also tinned.

5. The head and worm are to be constructed in the ordinary manner.

The furnace and boiler are to be placed at a proper distance from the alembic, and the boiler filled with water, the two parts connected together, and the boiler heated; powdered almonds are now to be mixed with a sufficient quantity of water to form a paste. To render this paste less compact, several handfuls of finely cut straw are to be added to it, and the whole divided into small masses about the size of a walnut, which are to be gradually thrown into the water bath. Care must be taken to place a wooden cylinder perpendicularly in the centre of the vessel, which is to be removed when it is filled, by which means a chimney is formed, which permits the vapour to penetrate through the whole of the contents of the vessel.

Finally, the still is to be adapted and all the joinings luted. It is best, particularly in winter, to cover the still with several folds of linen, in order to prevent too quick a condensation. All being thus disposed, the fire is to be increased under the boiler in order to bring the water to ebullition.

at first of a reddish yellow, and it is only after exposing them to air, that they become green, and finally blue.

It is to be understood, that we do not speak of the colour of the precipitates at the moment they are formed by an alkali, but only after they have been re-dissolved by an excess of hydro-chloric acid.

There is also another observation to be made, which is, that if we mix nearly equal parts of the milky distilled water with that which is transparent, the whole becomes limpid. There is then in the first product, a substance which contributes to the solubility of the essential oil, and as the first product contains more of the cyanic compound we have mentioned, this property is probably owing to it. What is certain, is, that the transparent water contains much more essential oil than the milky water which comes over afterwards; and in so great quantity, that by rectifying it, we nearly double the product.*

M. Vogel has advised the employment of barytes water, to facilitate the extraction of the oil of bitter almonds, and it may be presumed, that he was led to this idea, by the persuasion that the distilled water was acid; but it is important to know, that in thus having recourse to alkalies, we withdraw the cyanic compound which we have mentioned, and consequently the essential oil no longer possesses its primitive properties, particularly those relative to its action on the animal economy.

Moreover, the abstraction of this cyanic compound much diminishes the proportion of oil. It is therefore most advantageous to follow the process we have indicated; nevertheless, it might perhaps be useful under some circumstances to rectify this oil over an alkali, and especially when it is intended to

* This observation has induced us to adopt the following method. When we have collected a sufficient quantity of the distilled water and essential oil, we mix the whole in the body of a still, and separate in a few minutes by distillation all the essential oil, for it is so volatile, that it immediately leaves the water, and passes over with the first ounces of the product. It would therefore be useless to continue the operation, for what afterwards comes over, does not contain any additional quantity. By proceeding thus we obtained nearly one eightieth of essential oil.

use it as an aromatic, as then it would offer less danger in its employment. This observation is the more opportune at the present time, as there is a great consumption of this oil for such purposes, as it is a perfume which has become very fashionable, particularly for fancy soaps.

Once acquainted with a good process for preparing this oil, and certain of obtaining it perfectly pure, we again undertook its study under another point of view. Having previously satisfied ourselves that when recent it was perfectly neutral, we applied ourselves particularly to investigating whether benzoic acid primarily existed in it, or if it only contained its elements. We flatter ourselves in being able to throw some light on this interesting question, as may be seen by the following experiments.

One of the means which appeared to us the best adapted for obtaining the proposed object, was to determine whether the oxygenation of the essence caused an augmentation or a loss of weight in the solid residue, for as nothing but benzoic acid is obtained after the oxygenation, one of two things must take place, either this oxygenation converts the whole of the oil into benzoic acid, or it sets this acid free, by transforming the body that saturated it into volatile substances which are dissipated. This experiment, which appears to be very simple, nevertheless presents great difficulties, from the volatility of both the essential oil and of the acid it developes. Whenever, in fact, this essence comes in contact with air or oxygen in close vessels, the interior of the vessel becomes covered with small crystals of benzoic acid, some of which are fixed by one of their extremities, and when detached form small brilliant scales, whilst others are grouped in such a manner as form a kind of crystalline covering or crust, which cannot be detached without occasioning a considerable loss. Thus, it is altogether impossible to give credit to the results that may be obtained by this method. We were, nevertheless, able in a great measure to obviate these fallacies, by putting the oil into a small phial with a flat bottom, and a long straight neck, and placing this

small vessel, after having ascertained its exact weight, under a receiver filled with oxygen, over mercury. By this procedure we obtained a slight augmentation of weight; but we tried this experiment but once, and dare not vouch for its accuracy.

Little satisfied with this result, we had recourse to dry chlorine, thinking, that if the acid was already formed, it would probably be found saturated with carburetted hydrogen, and that in such case we would obtain hydro-carburet of chlorine, and the benzoic acid would be set free. We therefore then disposed an apparatus in such a manner as to cause a current of dry chlorine to pass over the surface of a certain quantity of essence that had been kept several days in a dry vacuum. We at first thought that things were going on conformably to our expectations, for we soon saw a multitude of prismatic crystals precipitated to the bottom of the fluid, and remain there during the whole of the operation, although it was continued much longer than was necessary. We took these crystals for benzoic acid, but when the experiment was finished, and the apparatus taken down, we soon recognized our error. The supernatant liquid had acquired a lemon colour, emitted very pungent vapours, which strongly irritated the eyes, and the odour of which reminded us of the compounds of chlorine and hydro-cyanic acid.

This liquid readily united with water; the mixture heated to ebullition disengaged much hydro-chloric acid, and let fall on cooling a precipitate; of beautiful lamellar crystals in long tufts, which formed at the surface of the liquid, and extended towards the bottom. These crystals, collected on a filter, afterwards dissolved in distilled water and properly purified, presented all the characters of the acid obtained by the oxigenation of the oil.

On the other hand, having examined the crystals that were formed spontaneously during the action of the chlorine, we were convinced that they were not analogous to the preceding acid. In fact, those crystals, after having been successively

compressed between several thicknesses of filtering paper, emitted a sweet and peculiar odour. They apparently did not dissolve in water, even when boiling, while hot alcohol dissolved them in almost every proportion, depositing them plentifully, on cooling, in prismatic crystals of a dull white colour, with very little odour or taste; but which, exposed to a moderate heat, liquified like an oil, but did not volatilize; and when thrown on a burning coal emitted a strong smell of hawthorn. These crystals, which were perfectly neutral, appeared to us somewhat similar to those obtained by treating the essential oil with caustic potass.

We must, however, own that we have not pushed our researches very far on this subject.

This experiment appeared to us clearly to show that the benzoic acid did not pre-exist in the essential oil of bitter almonds, but that it was the product of its oxigenation. Hence, in our opinion, this essence must contain a kind of benzoic radical. This idea is in strict conformity to an opinion long since made public by one of us, as regards ethers of the second class; an opinion which consists in not admitting acids as fully formed in this sort of compounds. Moreover, as we have no intention of supporting or combating this or that opinion, but merely to seek for the truth, we have made new experiments in order to acquire more exact notions on this subject. Thus, in hopes the caustic alkalies might possibly give us some decided results, we made the following experiments, which were performed with the utmost care.

Fifteen grammes of pure caustic potassa were put into a small vial with a ground stopper, and a quantity of distilled water added, sufficient to fill the vial about two-thirds full, whose capacity was about 60 grammes. The solution being made and allowed to cool, we introduced into the same vial, by means of a very small pipette, five grammes of pure essence, which floated on the surface of the alkaline solution; afterwards we managed to fill the vial with pure water, which, as is well known, is lighter than the essence. The result was

that the latter formed an intermediate layer between the other two liquids, so that the neck was filled with pure water, as we added a sufficient quantity of it to entirely displace the air. In this state of things the stopper was introduced, displacing the necessary quantity of water, and precaution taken to fix it tightly. This done, we agitated it strongly for some minutes. The water and alkaline solution united; but on the least repose, the oil rose to the surface.

We took care to prevent the introduction of air, by inverting the bottle and placing the neck in water when we were not agitating it. After two or three days of reaction, we noticed some small shining crystals floating in the inferior liquid, and also saw that they united with the oil by agitation, but formed anew in the course of a few hours, and that in fifteen days these crystals were multiplied to such a degree that the oil had entirely lost its fluidity. This operation was continued for more than a month, the bottle being very often agitated each day; and the bottle was not opened until several days after we had observed the oil had become completely solidified.

When, finally, we wished to know the results, we poured the whole on a small filter and immediately saturated the liquid that ran from it with hydro-chloric acid. To our great astonishment, it did not produce the least deposit, and our surprise was still increased by seeing the shining crystals which remained on the filter dissolve in the water that we poured on to wash them, giving rise to a milky solution. These crystals thus formed a species of soap. The milky solution being distilled, we obtained some drops of an essence which had scarcely any odour.

This new experiment appeared to us strongly confirmatory of the preceding, as we think that every thing tends to show that if the acid had pre-existed in the seeds, we might have withdrawn it from the potassa, as happens when we treat the essence in contact with air, by the same agent, though in a much less degree of concentration, but aided, it is true, by heat. It is sufficient to boil some essence of bitter almonds for

a few moments, in contact with a solution of potassa, to obtain, at the moment of saturation, an abundant precipitate of benzoic acid.

Having been as fully convinced on this point as these kind of researches admit of, we endeavoured to discover whether other means of oxigenation would produce the same effect as those to which we had recourse; in consequence we treated some grammes of the essence with nitric acid by heat, the acid being of the usual strength. The reaction was very violent, and manifested itself by a strong disengagement of nitrous vapours. We obtained, by means of this treatment, an acid similar to the preceding, and which, when purified, represented rather more than half the weight of the essence employed.

All these facts are in accordance, and it does not seem possible, that the non-pre-existence of benzoic acid in the essential oil can be called in question.

We had arrived at this stage of our inquiries, when we became acquainted with the new researches of M. Liebig on the acid of the urine of the herbivora, and hastened to ascertain whether our acid, which was likewise derived from an azoted body, did not itself contain azote, but we found no trace of it; and besides, notwithstanding all the deference we owe to the opinions of M. Liebig, we must avow that the existence of his sulphuric acid as a body, *sui generis*, does not appear to us by any means to be yet proved. We have seen, in the course of our practice, so many of these anomalies presented by organic combinations, that we are by no means disposed to think that the benzoic acid obtained from the urine of the herbivora, is formed by the action of heat. We remain convinced, on the contrary, of its pre-existence in urine, and the interesting discovery of Fourcroy and Vauquelin seems to us to remain in full force.

M. Liebig, after having found that sulphuric and hippuric acids, heated together, gave rise to sulphurous and benzoic acids, made a deduction from this circumstance, altogether favourable to the non-pre-existence of benzoic in hippuric

acid. We own, that this demonstration does not appear to us to be very *strict;* for what must occur if an organic substance more alterable than benzoic acid, be found united with it, and we treat the mixture with sulphuric acid? Precisely what happens with the hippuric acid. Besides, it may be presumed that M. Liebig is not himself entirely convinced on this point, since he grants, in the following paragraph, that we may regard the hippuric acid as a combination of benzoic acid with an unknown organic substance; and in this we entirely agree with him. Would it not indeed be very surprising that three agents, as distinct as heat, sulphuric and nitric acids, convert the hippuric into benzoic acid, if the latter was not already found in it. Hence, the proofs adduced by M. Liebig, do not appear to us sufficient to establish that our first masters were mistaken; and he will certainly permit us to defend their rights until new experiments decide the question in a more positive manner.

Of Amygdaline and its Properties. After we had satisfied ourselves, by all the means in our power, that benzoic acid did not exist in a formed state in the essential oil of bitter almonds, we had not only to search for this body in the almonds themselves, but also to endeavour to discover the product that might contribute to the creation of the acid; and as, among all the products that we have obtained, none had so much attracted our attention as the white crystalline matter before-mentioned, we were naturally induced to examine it more closely, and this examination has afforded some facts which appear worthy of attention.

The following are the most important. We have already said that this remarkable substance developed at first a sweet taste, which was soon followed by a bitter one, that perfectly recalled that of bitter almonds. Now it is to be observed that this same taste is also found in the distilled water, and in the essence of bitter almonds. It was, therefore, very probable that our crystalline matter was not different in its properties, nevertheless it is entirely inodorous; it was not at all volatile,

whether alone or mixed with the different agents that would seem to have the power of developing this property if it was susceptible of it.

When heated in a small tube it swelled, giving out at first an odour of burnt sugar, but towards the end of the calcination, that of hawthorn was distinguishable. This substance appeared to be altogether unalterable in the air; it completely resisted the action of chlorine when both were dry, at least no external change was visible; but if little moisture was present, a sort of tumefaction was to be remarked, and if the residue was heated with a greater quantity of water, it remained insoluble; the whole united itself into a white dry mass, inodorous and friable like a resin. Alcohol did not dissolve any portion of it.

When this substance was heated with a solution of caustic potash, it disengaged, as we have before said, a decided and strong odour of ammonia, and the solution gave no trace of hydrocyanic acid. There was no precipitation on saturation, nor did it appear to us to form an acid by means of this reaction; nevertheless we would not venture to affirm this, and the experiment requires repetition: all that we are able to affirm is, that this substance contains nitrogen, for under the same circumstances it constantly furnished ammonia, whatever degree of purification we had submitted it to.

Action of Nitric Acid on Amygdaline. Nitric acid is the only agent which appears to us susceptible of establishing any relation between this substance and the essential oil of bitter almonds. In fact, like this, it furnishes, as a result of this treatment, an acid which possessed the characters of the benzoic. It is true it is obtained in a small proportion, and with more difficulty, as the nitric acid sometimes acts with so much force as to destroy the benzoic acid as it is produced; but it is certain that by taking proper precautions we may be sure of obtaining it, and that these two acids do not present any difference on a comparative examination.

By comparing all the results acquired, it will be seen that

it is impossible not to admit the great probability of the substance here mentioned powerfully contributing to the formation of the essential oil, for it may be recollected,

1. That when this substance is removed, there is no possibility of developing either odour or taste in the residue.

2. That benzoic acid does not pre-exist either in almonds or the essential oil itself.

3. That both the essential oil and our crystalline matter, treated by nitric acid, afforded benzoic acid.

It still remained to ascertain in what manner this new product assists in the formation of the essential oil, and how it acquires odour or volatility. There is certainly some unknown body contained in it that serves as a common bond, and which eludes our researches. We have fully proved that the intervention of water was indispensable; but this is not all, and it may be presumed that the substance which converts itself with so much facility and promptitude into hydrocyanic acid, is also that which, by its union, produces the odour and volatility. But what is this other substance that renders itself so manifest by its effects? This we have not yet been able to discover, and it remains for those who may be more learned and fortunate. In the mean time we shall restrict ourselves to fully proving that the substance above described is entirely distinct from all hitherto known.

Its colour, crystallization and saccharine taste at first led us to suppose that it might be mannite, and we were the more disposed to think so, as among the products we have extracted from the bitter almonds there was another saccharine matter that seemed to us to be the uncrystallizable sugar of this supposed mannite; but both these products being submitted to the action of nitric acid, behaved so differently that it was impossible to recognise any likeness. The uncrytallizable sugar furnished a great quantity of oxalic acid, whilst our substance gave none but the benzoic. Hence it certainly merits a rank among organic products. We wished to give it a name that would show the species of almonds which contained it; but as

botanists have not yet established a distinction between the trees which furnish the sweet and bitter almonds, we are induced to adopt the denomination of the genus, and shall call it *amygdaline.*

Composition of Amygdaline. As it was not sufficient to have recognized nitrogen in amygdaline, but was also requisite to determine the proportion of it, we begged two of our friends and colleagues, Messrs Henry, Jun. and Plisson, who have for a long time occupied themselves with the means of perfecting the elementary analysis of organic substances, to determine the proportions of this: and the following have been their results:

Carbona	58.616	or	19 atoms.
Hydrogen	7.0857	or	28 atoms.
Nitrogen	3.6288	or	1 atom.
Oxygen	30.7238	or	7 atoms.

We were much surprised to find so small a proportion of nitrogen; as the quantity of ammonia disengaged by the action of caustic potash on this substance seemed to indicate more of it. But, in fine, this analysis, although repeated several times, always furnished the same results; and the great skill that our colleagues have acquired in this kind of experiment, does not permit us to entertain the slightest doubt of their exactness. Nevertheless, with all the perfection they have been brought to, are our means of analysis sufficiently certain for us to place implicit confidence in them? Besides, is nitrogen itself sufficiently known to permit us to affirm that the properties which distinguish it are never wanting? There is also another fact fully as interesting that deserves a place here; it is that in the manufacture of benzoic acid we have often been struck with the odour of hydrocyanic acid, particularly on opening the apparatus in which the acid has been sublimed. This phenomenon is not constant, though it frequently takes place. If it now be taken into consideration that benzoic acid, under different circumstances, derives its origin from substances containing nitrogen, as the hippuric acid of M. Liebig, the essential oil

of bitter almonds, and of the cherry laurel,* does it not seem probable that benzoic acid itself may contain it? and that if we do not find it, it is from our want of means, or from the minute quantity that it presents.

Finally, we are far from wishing to give more importance to these conjectures than they really merit, and we only mention them here to invite the attention of those who devote themselves to these kind of researches.

Conclusion. In the last analysis, we think that we have sufficiently demonstrated,

1. That the volatile oil of bitter almonds does not pre-exist in the fruit, and that water is essential to its formation.

2. That benzoic acid does not pre-exist in the volatile oil, and that oxygen is indispensable for its development.

3. That there exists in bitter almonds a particular principle which contains nitrogen, that appears to be the only cause of the bitterness of the almonds; and one of the elements of the essential oil.†

ARTICLE XXI.—*On Cajeput Oil. By M. Guibourt.*

This volatile oil is obtained by distilling the leaves of a shrub in the Molucca islands, named *caju-puti*, that is, *white tree.* It belongs to the natural order of the Myrtaceæ, and was described by Rumphius under the name of *arbor alba minor*, (*Herb. Amboy. lib.* 2, *cap.* 26, *tab.* 17, *fig.* 1) to distinguish it from other species which also bear the name of

* The oil of the laurus cerasus and that of bitter almonds appear to be of the same nature; they possess similar properties.

† As it is probable that this substance possesses some decided medical properties, we have desired one of our most skilful practitioners to make a trial of it under this form, and we shall know the result at some future time.

caju-puti, but which do not furnish the oil. These different trees were united by Linnæus under the title of *Melaleuca leucadendron;* but were again separated: and at present the species under consideration is termed *M. cajaputi*, Maton or *M. minor*, Decandolle.

According to Thunberg, cajeput oil is of a grass green colour, very fluid and inflammable; of a camphoro-terebinthinate smell, disagreeable when too strongly inspired, but agreeable in small quantities. According to Rumphius, who obtained it from the leaves of the plant by fermenting, drying and afterwards macerating them in water for twelve days, the oil is clear, transparent, very volatile, having a strong smell of cardamom, but more agreeable. This resemblance of its smell to that of cardamom, is so great, that many authors previous to Rumphius were of opinion that the cajeput oil was produced by distillation from cardamom seeds, and hence some writers have termed one species of this plant *kajuput;* but there is now no doubt that the true oil of cajeput is produced by the *M. cajuputi.*

The cajeput oil has always been subject to adulteration, and Murray states in his *Apparatus*, Vol. 3, p. 325, that the beautiful green colour of this article is considered by many experimenters, as owing to the addition of a green resin, or to copper, and that this oil is also manufactured from several others of inferior value. It may readily be supposed, that now when this oil is extolled as a sovereign remedy against the cholera, our sophisticators will not be surpassed by their predecessors; hence many persons have deemed it would be useful to determine the characters of the genuine article. I have thought, that being at so great a distance from the place of its production, that it was only by the comparison of a great number of specimens, that any certainty was to be expected.

No. I.—*Cajeput oil from Amboyna.* M. Chardin Hadancourt was kind enough to divide with me a small quantity of this oil, labelled *Cajeput Oil, distilled at Amboyna from the leaves of the M. cajuputi, and brought directly from*

thence. This oil was very fluid, transparent, of a very light bluish green colour, of a powerful smell, resembling that of turpentine, camphor, peppermint, and rose; or rather, this smell, which is agreeable, is peculiar to the cajeput, as it was present in all the genuine specimens I examined. At 18° C. this oil was of the sp. gr. 0.916, corresponding to 23° of Baumé's areometer. It was entirely soluble in alcohol; when eight or ten drops were poured on a piece of sugar and exposed to the air for a short time, and an ounce of water poured over it; the oil rose to the surface, preserving its transparency, and without any appearance of opake matter; finally, when this oil was agitated in a glass tube, with its own volume of a solution of cyanide of potassa and iron, it lost its slight green colour, and formed a red precipitate of ferruginous copper, indicating that this colour is owing to copper.

No. II.—*Cajeput oil obtained in London in* 1817, *from the East India Company's warehouse, and transmitted by M. Planche.* This oil, like the preceding, and indeed all that will be spoken of, was very fluid, perfectly transparent, and deposited no sediment in the vessel in which it was kept, and was wholly soluble in alcohol. I will not again allude to these characters, which must be present in all pure specimens of the oil.

This oil was of a tolerably dark green blue, and had precisely the same smell as the preceding; sp. gr. 0.917. After being agitated in a glass tube with half its volume of ammonia, the two fluids soon separated, and assumed their usual transparency; but the oil was deprived of all green or blue colour, assuming a yellow tint, whilst the ammonia was tinged of a pale blue or greenish; when treated by bi-cyanide of potassa and iron, it was entirely deprived of colour, and formed an abundant precipitate of a reddish purple tinge. This oil, therefore, owed the whole of its green colour to the oxide of copper, which it held in solution.

No. III.—*Cajeput oil, obtained from a druggist in Paris.*—The smell of this oil was similar to that of the pre-

ceding; it was of a beautiful deep green colour; sp. gr. 0.919 or $22\frac{2}{3}°$ of Baumé's areometer. Treated by ammonia, the separation of the two fluids, and the loss of colour of the oil, took place as in the preceding; except that although the original colour of the oil was at least as dark, the ammonia assumed a much lighter shade of blue, and if an equal or greater volume of the alkali was used, the whole colour disappeared.

Fourteen ounces of this oil were agitated in a bottle with about three ounces of a solution of the cyanide of potassa and iron. After remaining undisturbed for twelve hours, it was filtered, the two fluids passed through the filter with great ease, and the ferro-cupreous hydrocyanate remained on the paper. The oil was a yellow colour with a slight tinge of green, and contained no trace of copper; the alkaline ferro-cyanide, on the contrary, was in great excess in the fluid. This cyanide aided the insolubility of that of the copper; for when I wished to wash the latter with distilled water, it was partly dissolved, so that I was obliged to again render it insoluble by adding the saline solution to it; I therefore limited myself to washing it with alcohol, which did not entirely deprive it of the alkaline cyanide; dried at the temperature of boiling-water, it was of a beautiful purple colour, and weighed only ten grains, making about-two thirds of a grain to each ounce of the oil. In supposing that this red hydrocyanate was pure, it only represented two-ninths of a grain of metallic in each ounce of the oil, a trifling quantity when the usual doses of this medicine are taken into consideration. However, to ascertain the precise quantity of the copper, I burnt the filter, calcined the residue, removed the potash by washing with water, treated the remainder with boiling nitric acid, evaporated to dryness, and treated the saline mass with ammonia. The ammoniacal solution filtered and evaporated, gave two and one fifth grains of deutoxide of copper, corresponding to $1\frac{3}{4}$ grain of metallic copper. This quantity of copper is so minute, that I am of opinion that the oil may be employed without subjecting it to any previous manipulation.

No. IV.—*Oil of cajeput, obtained from the same druggist, at a subsequent period.* This oil was of a deeper blue than the preceding, and more analogous to that from M. Planche. Its colour was entirely removed by the ammonia, which assumed a marked blue tint; it formed a precipitate, the alkaline ferro-cyanide; its sp. gr. was 0.913.

No. V.—*Oil of cajeput recently imported from Germany.* This oil was of a green colour, verging a little on yellow; like the preceding it contained copper; its sp. gr. was the same as No. 4. A skilful experimenter, M. Cottereau, in examining it, thought it had too strong a smell of camphor, and proposed that I should test it with sugar, a plan which he informed me was used in Germany to detect volatile oils adulterated with camphor. In fact, on this oil being tested with sugar and water, it afforded a quantity of a white opake substance, which we at first supposed to be camphor. In consequence of this, I refused the oil; but the merchant who wished to sell it, believing it genuine, added a half drachm, a drachm, and finally two drachms of camphor to an ounce of oil, similar to No. 3, and demonstrated to me that this oil, when subjected to the action of sugar and water, gave no indication of the presence of the camphor.

This experiment, hence, proves that this test is not conclusive, and renders it probable that the white substance, which separated from No. 5 was not camphor; perhaps it is natural to the oil, or produced by one of those spontaneous alterations to which the volatile oils are very subject.

I will not attempt to describe many other pretended cajeput oils which I observed in different shops, and which had been recently manufactured, possessing a strong smell of mint, rue or savin; but I cannot pass over an oil which a druggist of Paris advertised in the newspapers as having received direct from the East Indies, and stated that it was only at his shop that it was to be found in a pure state. This oil was of a bright grass-green colour, which was owing, in a great measure, to the presence of copper; but after having treated it, like the

preceding specimens, it still retained a green tinge, arising from an admixture of chlorophylline. It had a mixed smell of rosemary and rue, and must have been principally formed of the volatile oils of these two plants. Moreover, what proves that this oil was fabricated from essences of our climate, which, as is well known, are lighter than those from tropical countries, was, that its specific gravity was only 0.8945, 27° of Baumé, whilst the genuine oil varies from 0.919 to 0.916, or at most to 0.913.

To recapitulate, cajeput oil is very fluid and transparent, forms no deposit in the vessels in which it is kept, is wholly soluble in alcohol, and has a specific gravity of 0.916 to 0.919 at 18° C. It has a peculiar smell which is agreeable in a small quantity, and which resembles that of a union of turpentine, camphor, peppermint and roses. This last odour is predominant when the oil evaporates spontaneously. It is generally of a green or bluish green colour, which it owes to the presence of oxide of copper, but the quantity of this oxide requisite to produce this colour is never more than $\frac{1}{12}$ of a grain in an ounce, and does not affect its medical properties.

It may, however, be deprived of it, without detriment, by agitating it with a solution of cyanide of potassa and iron, filtering and separating the aqueous solution. The same result is obtained by distillation, but not so effectually.

Finally, cajeput oil should have no particular smell of turpentine, camphor, peppermint or roses; and above all, it should have no odour of rosemary, sage, savin, rue, or of any of our native essential oils.

On the colour of Cajeput Oil. The natural colour of cajeput oil is green; for being attached, fifteen years since, to the "central pharmacy of the hospitals," I distilled the leaves of several species of *Melaleuca*, *Metrosideros*, and *Eucalyptus*, cultivated in the garden of plants, and obtained from them all a volatile oil analogous to that of cajeput, which contained no copper, and which was of a beautiful green colour. M. Henry still possesses one of these oils, that of the *Euca-*

lyptus robusta, which is of a fine emerald green, and is remarkable for its mixed and delicate odour of mint and lemon. But, it is possible that the green colour of the cajeput oil may disappear in time, or that it may be destroyed by the defective plan of procuring the oil spoken of by Rumphius. Then, either accidentally from remaining in copper vessels, or intentionally by the addition of some cupreous salt, the oil assumes the green colour which distinguishes it. What makes me think that it rather arises from the first of these sources is, that spirits of turpentine become more completely coloured by contact with metallic copper, than by the addition of verdigris, which only imparts a faint tinge to it, and is partly separated by rest.

I may also remark that the green colour of the genuine cajeput oil, although owing to copper, is oftentimes deeper than would be indicated by the small quantity of copper it contains, being somewhat analogous to what takes place in the preparation of pickles, where the presence of a piece of copper during the boiling of the vinegar, and the absolutely inappreciable quantity of copper dissolved, suffice, by the combination of the metallic oxide with some vegetable principle, to produce a bright and durable green colour, and which can scarcely be deemed injurious.

On the Specific Gravity of Volatile Oils. Having had occasion to speak of the utility of specific gravity as a good character for the verification of cajeput oil, it may not be uninteresting to lay before our readers the following table of the density of a great number of volatile oils. I am mainly indebted for it to M. Chardin Hadancourt, who has paid great attention to this subject. It is only necessary to remark, that the majority of the results were obtained with the alkalometer of Gay Lussac, and that, from this gentleman not having stated the concordance of his instrument with the tables of specific gravities, I have been obliged to calculate these by means of Cartier's and Baumé's areometers; and in supposing with M. Gay Lussac, that the areometer of Cartier marked 10° in dis-

tilled water, and that 29° of Cartier equalled 31° of Baumé, it is certain that this double calculation may tend to create doubts as to the exactness of the results here given.

Nature of the Volatile Oil.	Name of the Experimenter.	Deg. of Temp. Centig. Ther.	Centigrade Alkalometer.	Areometer of Cartier.	Areometer of Baumé.	Pese-sel of Baumé.	Specific Gravity.
Almonds, bitter, rectified	Chardin	25				10	1.075
Aniseed	"	25	28.50	14	14.28		0.972
" East Indian, (*Illicium anisatum*)	"	25	28.50	14	14.28		0.972
Bergamot	"	25	76.33	29	30.30		0.8675
"	Guibourt	18			30		0.879
"	Chardin	18.75	74.50	28.50	29.75		0.880
"	"	12.50	73	27.50	28.70		0.886
Cajeput from Amboyna	Guibourt	18			23		0.916
" " M. Planche	"	18			23		0.917
" green, No. 3	"	18			22.66		0.9192
" distilled, colourless	"	18			23		0.9162
" " green	"	18			22.66		0.919
" pale green, recently imported	"	16			22.33		0.9207
" blue, No. 4	"	18			23.66		0.913
" green, No. 5	"	18			23.66		0.913
" false	"	18			27		0.8945
Camphor, purified	Brisson	11.50					0.9887
Cinnamon	"	12.50				6	1.0439
" from Ceylon	Chardin	25				3.5	1.0255
" " China	"	25				7.5	1.0560
Caraway	"	25	62	23.25	24.15		0.910
Cedrat	"	25	83.33	33.50	35.10		0.8515
"	Guibourt	18			31		0 8709
Cedar	Chardin	25	37	16	16.40		0.959
Copaiba	"	18.75	69.33	26	27.10		0.8944
Cummin	"	18.75	54	20.50	21.20		0.928
Tarragon	"	25	50	19.25	19 90		0.9356
Lemon, not distilled	Guibourt	18			33		0.8627
" "	Chardin	25	84.33	33	34 33		0.856
" distilled	"	18	84.33	33	34.33		0.856
Fennel	"	25	69	25.75	26.80		0.896
Cloves	Brisson	12.50				5	1.0363
"	Chardin	25				8.5	1.035
Lavender	"	25	73	27.50	28.70		0.8865
"	Brisson	12.50			26		0.8938
Mace	Chardin	25	53.50	20.66	21.40		0.9266
Peppermint (English)	"	18	63	23.50	24.40		0.9086
" (French)	"	25	61	22.66	23.55		0.914
Nutmeg	"	25	57.75	21.50	22.30		0.921
Orange (Portugal)	"	25	87	34.50	36.20		0.846

Table Continued.

Nature of the Volatile Oil.	Name of the Experimenter.	Deg. of Temp. Centig. Ther.	Centigrade Alkalometer.	Areometer of Cartier.	Areometer of Baumé.	Pese-sel of Baumé.	Specific Gravity.
Orange (Seville)	Chardin	25	83.33	33.50	35.10		0.852
Pimento	"	25				6	1.044
Rosemary	"	25	69.50	26	27.10		0.8944
"	Guibourt	18			29		0.8847
Roses (Damask)	Chardin	25	78	29.75	31.10		0.8725
" (Province)	"	25	80	30.75	32.20		0.867
Yellow sandal	"	25	29	14.50	14.80		0.9684
Sassafras	"	25				11.75	1.089
Sage	Guibourt	18			22		0.9224
Turpentine	Brisson	31.66			31.66		0.8697
" rectified	Guibourt	8			31		0.8742
Thyme	"	18			27		0.8936

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Article XXII.—*On the Gelatinous Principle of Fruits. By M. Henry Braconnot.*

All that is known respecting the substance so long designated by the name of jelly, is merely a few uncertain facts, and in fact it may be asserted that its real nature is still unknown. Nevertheless, as it is a principle universally found in vegetables, it merits the attention of physiologists, for it appears, that it is with this substance that nature forms plants, and that after having undergone various transformations, during the period of their growth, it is kept in reserve as it were, to serve for the nutrition of new individuals of the species.

When I gave an account of the properties of pectic acid, it appeared to me that it had some analogy with the gelatinous principle of fruits. M. Vauquelin, in a memoir on pectic acid and the root of the carrot, states that he found no difference

between these two substances: this memoir, however, contains some erroneous assertions, which show that this able chemist did not himself observe all the facts mentioned in it. At the same time, it cannot be denied, that pectic acid is almost insoluble in water, whilst the mucous jelly which is not acid, is abundantly found in solution in their juices. These two bodies, therefore, are not identical.

Before commencing the consideration of the properties of the gelatinous principle of fruits, and as a preparation for that investigation, I have thought that an examination of the juice of the currant would lead to a better understanding of the subject.

Experiments on Currant Juice. The juice of the currant (*Ribes rubrum*) has already been examined by many chemists, among whom may be cited, Proust, John, Henry, Guibourt, Payen, Berard, &c. but these experimenters are not in unison as respects the nature of the gelatinous substance which it contains. Currants in a double linen bag were subjected to the gradual action of a press; the product was a limpid fluid which underwent the following changes with reagents.

The mineral acids, even after a long time, produced no diminution of the transparency of this juice; hence it contained neither caseum, nor the glutinous or albuminous matter, which has been gratuitously supposed to exist in all fruits. The infusion of galls likewise produced turbidness, because the peculiar azoted matter it contains forms with the tannin a combination which is very soluble in weak acids; but if the juice be previously saturated with ammonia, the tannin then produces a tolerably abundant deposit, which appears to carry with it a part of the gelatinous matter, for the superincumbent liquid is then only feebly precipitated in jelly by alcohol.

Currant juice saturated with ammonia, and left to itself for twenty-four hours, does not change its appearance. If chloride of calcium or a mineral acid be added to this solution, they produce no remarkable change, and there is no separation of jelly, an evident proof that it contains no pectic acid. But

this recent juice is very differently acted upon by the fixed alkalies and the alkaline earths. If it be saturated with potass, and an acid be added, a large, transparent and insoluble mass of pectic acid is formed.

Currant juice partially saturated by potass or its carbonate, and left to itself, soon becomes a mass of jelly, which drained on a cloth, gives out an almost colourless fluid, which is not coagulable by alcohol. This mass is pectate of potass; redissolved in warm water, it gives a very large coagulum of pectic acid on the addition of an acid; whence it appears to result, that this is the product of the slightest contact of potass or its carbonate with the gelatinous principle of fruits.

If currant juice be partially or entirely saturated with hydrate of lime, the fluid speedily assumes the form of a transparent, trembling jelly, which takes the form of its containing vessel. This jelly, which appears to be the pectate of lime, is insoluble in boiling water and ammonia, but dissolves by the aid of heat in carbonate of soda, leaving a residuum of carbonate of lime.

Currant juice saturated with carbonate of lime or carbonate of magnesia, by means of a gentle heat, assumes on cooling the form of a homogenous jelly.

Barytes water instantaneously forms with this juice a gelatinous magma of a dull white colour. The nitrate of barytes coagulates it in a short time into a mass of transparent jelly.

Surcharged by means of heat with sulphate of soda or the chloride of sodium, this juice preserves its liquid character, and on cooling, furnishes crystals of these salts, without the slightest appearance of jelly, which, as is well known, is easily obtained by this means from sugar.

The chloride of calcium, the sulphate of lime, sulphate of alumine, or silicate of potass, do not occasion any peculiar change in currant juice.

The sulphate of the peroxide of iron, also, does not produce any change, even if potass be added to the mixture. Corrosive sublimate forms a slight precipitate, which appears to be attri-

butable to the azoted matter. The nitrate of silver, and the acetate of lime convert, in time, currant juice into a jelly. The acetate of lead occasions an abundant magma, soluble in ammonia and in nitric acid. The oxalate of ammonia forms a slight deposit of oxalate of lime.

The juices of other fruits, as plums, apples and apricots, treated in the same way, afforded nearly the same results.

Azoted matter of currant juice. Fabroni supposed that the vegeto-animal substance found by Beccari in wheat flour, was present in all fermentable juices; but he made no decisive experiment in support of his opinion, which does not appear to me to be correct, at least as regards all fruits.

If after having precipitated the gelatinous principle of currant juice by alcohol, the alcoholic liquor be evaporated, it gives a syrupy residue which contains the azoted matter, the saccharine principle and the free acids. This residue several times treated by rectified alcohol, leaves the impure azoted matter, attracting moisture, and furnishing on combustion a large proportion of potash, and its aqueous solution produces with infusion of galls a precipitate which disappears on the addition of a little distilled vinegar.

If the syrupy fluid, diluted with water, be saturated with chalk, the animal matter mostly precipitates with the earthy salts, and the supernatant liquor containing the saccharine principle is now only slightly precipitable by tannin.

Ammonia separates this animal matter from the syrupy liquid, producing in it a soluble precipitate, soluble in the acids. This precipitate when well washed produces carbonate of ammonia on distillation, and leaves a charcoal which it is difficult to incinerate, and which furnishes an ash almost entirely formed of phosphate of lime. But this animal matter is not wholly precipitated by ammonia, for on adding infusion of galls to the neutral fluid separated from the precipitate, a second deposit is formed, which is soluble in diluted acetic acid. Fibrine macerated in this fluid, forms a union with the tannin, and by evaporation to dryness, the azoted matter was

obtained, but it appears that it was not yet exempt from impurities, and especially from acetic acid.

I will not dwell at greater length on this matter, which ought to be further examined; but must not pass over in silence a remarkable fact, which was presented to me by the syrupy fluid, deprived, as has been stated, of the gelatinous matter by alcohol. Properly diluted with water, it resembled a limpid fluid, which subjected for several days to a temperature of 20° R., underwent no fermentation; nevertheless, it appeared to contain the elements capable of producing this phenomenon, namely, azoted matter and the saccharine principle. I dissolved sugar in it, but the mixture remained perfectly quiescent. I decided on distilling this sweetened fluid into two equal parts, and added to one non-azoted gelatinous matter; fermentation then took place rapidly and afforded an intoxicating liquor, whilst the other half of the fluid, deprived of gelatinous matter, remained undisturbed. It results from this experiment, that the azoted matter of currants, deprived of the gelatinous principle, loses the faculty of exciting the fermentation of sugar, and that the re-union of these two substances is necessary to produce this action; this is the more remarkable from the gelatinous principle producing no vinous effervescence with sugar.

Fermentation of currant juice. To make a comparison of the principles contained in fresh currant juice with those which are separated by fermentation, I procured the juice of red currants, which came from the press quite limpid, and remained so till the fermenting process began.* A very fine sediment was gradually deposited, which was separated by

* According to M. Thenard, currant-juice is rendered turbid by the ferment which it holds in suspension; but this turbidness is rather owing to the fragments of the pulp of the fruit. I have, however, remarked that the juice of white currants, when fully ripe, deposited a diaphanous jelly, having the exact appearance of pectic acid, though not identical with that substance, for when dissolved in a little of the solution of ammonia, it was not precipitated by the acids.

means of a filter. The clear vinous liquid, left to itself for a few days, afforded a second and larger deposit, and having a different appearance from the first; both being well washed, they were separately examined.

The first of these precipitates, on being distilled, afforded a large quantity of carbonate of ammonia and the hydro-sulphate of the same alkali. In its moist state it is insoluble in water, in the acids, and was scarcely dissolved by the caustic alkalies. It, moreover, presented all the properties attributed to ferment by M. Thenard. If this animal matter be compared with that of wine lees, marked differences are observable, for the latter is readily soluble in the weakest alkalies, which is not the case with the former. I supposed that this difference might arise from a larger proportion of phosphate of lime in the ferment of currants, as it afforded a sixth of its weight of this salt on combustion; but having separated it, by means of hydro-chloric acid, the residue was not dissolved by the alkalies in any greater proportion. Moreover, M. Gay-Lussac had already shown that ferment is not an identical substance.

The second precipitate formed in currant-juice, was not in as divided a state as the former. It had a gelatinous appearance, and even after being washed several times, still reddened litmus paper. Boiled in water, nothing was taken up by this fluid, and it did not gelatinise on cooling. Treated with water sharpened with ammonia, it was almost wholly dissolved, and the addition of lime water separated a considerable quantity of pectate of lime. On distillation, it furnished a less ammoniacal product than the first precipitate, and the carbonaceous residue, on being burnt, left a white cinder, almost entirely composed of phosphate of lime. It therefore appears that this second precipitate was mostly formed of pectic acid, united to azoted matter, similar to that first separated during the fermentation of the juice. But this latter, after having given rise to the two insoluble precipitates spoken of above, still contained azoted matter, which appeared to be identical with that con-

tained in the recent juice; for, like it, when saturated with ammonia, it was precipitated by infusion of galls.

I thought that I remarked more of the azoted matter in the fermented currant-juice than in that which had been recently expressed, but additional observations are requisite to support or invalidate this opinion. This recalls to my mind the hypothesis of M. Astier, that *ferment is a living matter formed of animalcules, and which he supposes to be the instruments made use of by nature to effect the decomposition of sugar.* What appears certain, is, that fermented currant-juice has no action on sugar, and yet, if it be exposed to the air, it gradually alters and becomes covered with a white pellicle, which is renewed as often as it is removed. This appears to be analogous to the organized production, or to use the expression of M. Bory de St Vincent, an *attempt at existence*, which is often met with on the surface of wine during its fermentation, and which has received the name of *mother*. But if this production be collected and mixed with sugar and water, it causes a fermentation as readily as the best ferment. Moreover, I am satisfied that this latter, like alcohol and carbonic acid, is a product of fermentation, which also appears to entirely destroy the gelatinous principle, by transforming it in part into pectic acid.

Examination of the Properties of the Gelatinous principle of Fruits. The existence of a gelatinous matter in fruits has been known for a long time, but there is much variance of opinion as to its properties. Vauquelin, who met with it in the cassia and the tamarind, was latterly of opinion, that it did not differ from pectic acid. John, on the contrary, supposed it identical with bassorine. M. Guibourt has given the name of grossuline to a product which he obtained from the fermented currant-juice;* but as it is manifestly the result of an alteration, we need not be surprised at its slight resemblance to the principle under consideration.

* Journal de Chim. Med. No. 1.

The gelatinous principle may be separated from all fruits by means of alcohol, which precipitates it in the form of a jelly. Thus obtained from fresh currant-juice, it is in inconsiderable quantity, if it is wished to preserve the alcohol; but, by permitting the mixture to remain undisturbed for one or two days, all the mucous matter coagulates into a mass of trembling jelly, which it is only requisite to compress gradually, and to wash well with weak alcohol, to have the gelatinous principle in a sufficient state of purity.

When dry, it is in membranous fragments which are semi-transparent and resemble fish-glue. In this state, if it be plunged into about 100 times its weight of cold water, it swells very much, like bassorine, and finally is completely dissolved, giving rise to a mass of homogeneous jelly, having the appearance of starch, but not affording any blue reaction with iodine, and sufficiently consistent to adhere together on reversing the vessel. By augmenting the quantity of cold water, and after a slight action, the solution presents a thick mucilaginous consistence, analogous to animal mucus, and its slightly opaline appearance seemed to be owing to the presence of a small quantity of fatty matter.

Boiling water appeared to have less action on this dried matter than cold; it was also soluble to a certain degree in very diluted boiling alcohol, although it is precipitated in a jelly by this fluid when cold. The mucous or gelatinous principle of fruits well purified by alcohol, is tasteless and insipid, and does not redden vegetable blues. It is by no means as adhesive as gum arabic. Its solution in water undergoes a change on the addition of acids or ammonia; but one of the most striking properties of this body, is that of being wholly and instantaneously changed into pectic acid on the addition of the slightest trace of a fixed alkali, or of an alkaline earthy base. If any one of the acids be added to an aqueous solution of this mucous body, no effect whatever is produced. A slight excess of potash or soda will likewise induce no apparent change, although in fact a very remarkable one does occur, for on

afterwards adding an acid to this combination, it will be coagulated into a single transparent mass of pectic acid.

If, instead of adding a slight excess of potassa or soda to the aqueous solution of the gelatinous principle, it be added in greater excess, then all the mucous matter is immediately precipitated in the form of an alkaline sub-pectate. The carbonate of potassa also transforms this substance into pectic acid; but neither carbonate of soda, nor concentrated ammonia, have this property. Lime water in excess precipitates the whole of the mucous matter in insoluble gelatinous flakes, which, washed with acidulated water, and then treated with boiling water, are partly dissolved; and the addition of a small quantity of ammonia completes the solution. On afterwards adding an acid to this mixture, a gelatinous precipitate is formed, whence it appears that lime water may also, at least in part, convert the gelatinous principle into pectic acid.

If to the solution of the gelatinous principle of fruits be added a small quantity of ammonia, and afterwards chloride of calcium, a mucilaginous precipitate is formed, which disappears on the addition of a diluted acid.

Water of barytes precipitates the whole of the solution of the mucous substance in the form of an abundant jelly of pectate of barytes. The nitrate of barytes also produces as much jelly as the preceding, but this differs in being wholly soluble in diluted nitric acid. The mucous solution, when boiled with caustic magnesia, is not coagulated; but, on evaporating to dryness, and treating the residue with hydrochloric acid, a gelatinous matter remains, which is pectic acid. The gelatinous principle of fruits is not precipitated by the chloride of calcium, the acetate of lime, the sulphate of lime, the acid carbonate of lime, or the sulphate of alumine; nor by the chlorides of mercury, of platina or tin, nitrate of silver, silicate of potassa, sulphate of zinc, acetate of manganese, chromate of potassa, or tartar emetic; but it is precipitated in gelatinous masses soluble in diluted nitric acid by the soluble salts of barytes and strontian, acetate of lead, nitrate of copper, nitrates of mer-

cury, sulphate of nickel, or the hydrochlorate of cobalt. Sulphate of the peroxide of iron, and sulphate of glucinia, also produce masses of jelly, soluble in a small excess of the precipitant; no effect is induced by the infusion of galls.

This gelatinous principle, as well as the azoted matter of currants, cannot separately cause the fermentation of sugar, but this phenomenon occurs if they be united. On dissolving sugar in a solution of the gelatinous principle, an imperfect jelly results which finally becomes stringy. On distillation, the gelatinous principle furnishes, without melting, an empyreumatic oil, and an acid product, strongly reddening litmus paper, and in which I was unable to recognize the presence of ammonia. A large proportion of charcoal remains, which leaves, on combustion, a yellowish ash, formed of carbonate of lime, sulphate of lime, oxide of iron, and phosphate of lime.

Treated by nitric acid, it furnishes, like pectic acid and most of the gums, mucic and oxalic acid, and very slight traces of the yellow bitter. Hydro-chloric acid, heated with a solution of this mucous matter, causes a reaction which changes the mixture to a beautiful red colour, and forms a flaky matter of the same colour, insoluble in ammonia.

From the above-mentioned properties, it is evident that the gelatinous mucilage of fruits ought not to be confounded with any other substance, and therefore requires to be designated by a specific name; that of vegetable jelly or gelatine will not do, as it has been applied by Berzelius to an azoted substance of a very different nature; as that under consideration, in its different combinations, appears in the form of a gelatinous coagulum, and which, moreover, can be readily transformed into pectic acid, I propose to call it *Pectine*. I have ascertained its existence in plums, apples, apricots, and other fruits; but after its desiccation, it sometimes requires an immersion in water for some days to dissolve it, which is an indication of impurity.

The mucilage of flaxseed, and that of gum tragacanth, do not present the properties which characterize the pectine. As

under the influence of potash or lime, this substance is so readily transformed into pectic acid, it might be supposed that this latter is oftentimes a product of the operation; but it will not be doubted that it also exists wholly formed in many parts of plants, for according to the judicious observation of Vauquelin, the development of the vegetable acids is principally caused, in a great number of cases, by the presence of alkalies. Moreover, I have already noticed the existence of pectate of lime in some barks, and on subjecting the *Ballota nigra* to some experiments, it furnished me with a large quantity of pectate of potash.*

I have every reason to believe, that pectine does not sensibly differ from the gelatinous mucilage which exudes between the bark and woody fibre, or the cambium of Duhamel, a primary substance, in which the first lineaments of vegetable organization are developed.—*Annales de Chimie, July* 1831.

* The *Ballota nigra* (Black hoarhound) grows abundantly on road sides; it is extremely bitter, nevertheless it does appear in our vegetable materia medica; although the inhabitants of Gothland, it is said, make use of it as a panacea in all their diseases. This plant afforded me, on analysis, a very bitter substance, destructible by heat; pectate of potassa in large proportions; malate of potassa; chloride of potassium; sulphate of potassa; a resinous matter; and phosphate of magnesia and lime. This result must not be considered as an exact analysis, for my only intention in the examination was to discover an anti-febrile substance, analogous to salicine. As to the latter, I may observe in passing, that it appears to me better to employ in fevers a simple decoction of the barks which contain it, than the salt itself, as we are then sure of always having it unadulterated, and besides these barks also contain a small quantity of an astringent and febrifuge tonic principle, which aids the action of the salicine.

Article XXIII.—*On the Different Species of Gums. By M. Guerin.*

[Extract.]

Among those chemists who have studied the gums, we find that Fourcroy, Vauquelin and Thomson, alone, have paid special attention to them. Other chemists have made detached experiments on some of them, but no one has given a general account of them. M. Guerin has endeavoured to fill this blank. Not satisfied with the classifications and divisions of gums given by Fourcroy and Thomson, he devoted several years to a study of these bodies. The classification of the immediate principles into different genera, being much less important than a proper division of the species, one or more of their chemical properties may be arbitrarily assumed as a generic type. Nevertheless, the properties which appear to be of most importance, are those which appertain to the transformation of different species into identical products. Thus, those of the genus sugar are its conversion into alcohol by fermentation, and into oxalic acid by means of nitric acid. The type of the genus *gum* is its conversion into mucic acid, a character which must be confined to such substances as are liable to be confounded with gum arabic. As regards the determination of species, a different course must be pursued; recourse must here be had to the nature and the proportion and arrangement of elements, before deciding that an immediate principle is peculiar to this or that species.

To simplify his investigations, M. Guerin divides gums into two classes, which he terms,

1. *Arabine.* Soluble in water, so named by M. Chevreul.
2. *Bassorine.* Insoluble in water, discovered by M. Vauquelin.

Before passing to the examination of species, the author commences with that of the principles forming the basis of his divisions.

Arabine. Colourless, inodorous, insipid, transparent, fracture vitreous, friable. At a temperature of 150° to 200° it softens, and may be drawn out into thin laminæ; it is unalterable in a dry atmosphere, but is capable of acidifying after an exposure for some months to a moist atmosphere; insoluble in alcohol, not crystallizable, not undergoing alcoholic fermentation; soluble in water, 100 parts of this fluid at 68° F. dissolving 17.75, and 212° F. 22.54. A concentrated aqueous solution remains unaltered in vacuo, but when exposed to the action of the air, it becomes acid, and mucor forms on its surface. The rapidity of this decomposition, which is only partial, is proportionate to the elevation of the temperature.

According to Thomson, the silicate of potassa is the best reagent for detecting the presence of arabine. M. Guerin, however, has obtained precipitates with the sub-acetate of lead from a solution on which the silicate had no action. Having passed a current of chlorine through a solution of one part of arabine in fifty of water for ten hours, white flakes were formed, having the smell of chlorine, reddening litmus paper, and containing arabine, azote, and chlorine or chloric acid. The fluid was acid, and afforded a chloride of calcium on the addition of lime, without any indication of citric acid, a result which differs from that obtained by M. Vauquelin.

By sulphuric acid, and by following the plan of M. Braconot, the author obtained an alcoholic liquor which afforded granulated crystals, having a fresh saccharine taste, and which would not ferment with yeast. Nevertheless, M. Couverchel, by treating the indigenous gums with oxalic acid, converted them into a saccharine substance analogous to that obtained on treating fecula with sulphuric acid.

One hundred parts of arabine treated with 400 of nitric acid, gave 16.88 of mucic acid and a little oxalic acid. If more nitric acid be used, less mucic and more oxalic acid will be obtained.

Bassorine. Solid, colourless, inodorous, semi-transparent, uncrystallisable, difficult to pulverise, insoluble in alcohol and

in hot or cold water, only absorbing this fluid and swelling greatly, not undergoing the vinous fermentation. 100 parts treated with 1000 of nitric acid, afforded 22.61 of mucic and some oxalic acid; with sulphuric acid, it gave a saccharine matter not convertible into alcohol. Bassorine is extracted by means of water from the gum bassora of commerce. It must not be confounded with the substance which M. Pelletier has extracted from the gum resins, and to which he has given the same name.

		Arabine.	Bassorine.
Composition.—Carbon		43.81	37.28
	Oxygen	49.85	55.87
	Hydrogen	6.20	6.85
	Nitrogen	0.14=100	0=100

Gum Arabic. When moistened, it reddens litmus paper; sometimes it has an acid taste; its aqueous solution, even when filtered, has a turbid appearance, which is owing to a small quantity of an insoluble azoted matter that it retains. Gum arabic several times treated with boiling alcohol affords supermalate of lime, chloride of calcium, potassium, acetate of potassa, a substance analogous to wax and chlorophylline. The ashes of this gum affords carbonates of potassa and lime, a little chloride of potassium, oxide of iron, alumine, silex, and magnesia.

Gum Senegal is in pieces which are sometimes very large, of an ovoid form and often hollow. Same properties as the preceding: the ashes give the same products.

Cherry Gum. This presents remarkable phenomena on the addition of water to it; when fragments are put into cold water they slowly swell, and are only partially dissolved. Thus 100 parts of water at 68° F. only dissolve 4.55 parts of this gum, and at 212° F. only 9.75, whilst the same quantity dissolves 24.17 of gum senegal, and 19.03 of gum arabic. Treated with alcohol and the nitric and sulphuric acids, it gives the same products as gum arabic; it is composed of,

1, Arabine; 2, Chlorophylline; 3, Waxy matter; 4, Traces o ligneous fibre; 5, Acetate of potassa, supermalate of lime, &c.

Apricot Gum. Same properties as cherry gum. The ashes contain the carbonates of potassa and lime, chloride of potassium, sulphate of lime, oxide of iron and silex.

Plum Gum. Similar to cherry gum in its properties. The ashes are identical with the preceding, with the exception of the presence of a little magnesia.

Peach Gum. Same properties as that from the cherry. The ashes give traces of manganese.

Almond Gum. Same properties as cherry gum. The ashes contain the carbonates of potassa and lime, sulphate of lime, chloride of potassium, oxide of iron, silex, and alumine.

Gum Bassora. M. Vauquelin, having macerated some in cold water for five days, could not dissolve the smallest portion of it; the same was the case when he used boiling water. These results are contrary to those obtained by M. Guerin, who has found this gum composed of two principles, the one soluble and the other insoluble in water; 100 parts of this fluid, at 68° F. dissolve 17.28 of the soluble portion, and 22.98 at 212° F.

Alcohol extracts from this gum, chlorophylline, a waxy matter, acetate of potassa, chloride of calcium, and super-malate of lime. Its ashes contain the carbonates of potassa and lime, traces of sulphate and phosphate of lime, chloride of potassium, alumine, silex, and magnesia.

Gum Tragacanth. According to Bucholz, this gum is composed of

Soluble part	57
Insoluble part	43=100

1. Seen through a microscope, gum tragacanth presents globules of various forms, some rounded, others oblong. The first resemble in form and size those of the potato; these globules are the only portions of the gum which are coloured blue by iodine.

2. After boiling gum tragacanth several times in water, the

filtered liquid is not coloured by iodine, whilst the insoluble portion assumes a blue tint.

3. It is probable, that the rounded globules of gum tragacanth, differ from those of starch only by the interior parts of the first being soluble gum, and those of the latter being soluble starch.

4. Gum tragacanth cannot be considered as a genus, since it contains several distinct principles: as arabine, or the soluble part; bassorine and starch, or the insoluble parts; waxy matter; chlorophylline, and various salts. Gum tragacanth is therefore composed of arabine and bassorine, containing a starch, which cannot be separated by boiling water.

Flaxseed. Its mucilage thickens water, is insoluble in alcohol, uncrystallizable, is not precipitated by galls or chlorine; is not coloured blue by iodine. Put into hot or cold water, it separates into two parts, the one soluble, and the other insoluble; the latter, treated with nitric acid, does not afford mucic acid, whilst 100 parts of the former give 14.25 and some oxalic acid. To obtain the soluble part, one part of flaxseed is to be treated by 100 parts of cold water; to obtain the insoluble portion, this fluid must be used at from 120° to 140° F.

Composition of mucilage of flaxseed:

Immediate.		Elementary.	
Water	10.30	Carbon	34.30
Ashes	7.11	Nitrogen	7.27
Soluble portion	52.70	Oxygen	54.74
Insoluble portion	29.89=100	Hydrogen	5.69=100

The ashes contain the carbonates of potassa and lime, phosphate of lime, chloride of potassium, sulphate of potassa, oxide of iron, alumine, and silex.

Soluble portion of the mucilage:

Immediate.		Elementary.	
Water	14	Carbon	44.75
Ashes	18.50	Nitrogen	1.01
Arabine and azoted matter	67.50	Oxygen	48.68
	100	Hydrogen	5.56
			100

The nitrogen appears to be owing to a small portion of the insoluble part retained by the soluble portion.

Mucilage of Mallow Root. This contains a little arabine, starch, asparagine, and inorganic substances.

Sugar of Milk. One hundred parts treated by 600 of nitric acid gives 28.62 of mucic acid, and rather more of oxalic.

Composition.—Sugar of milk		96.18
	Water	0.80
	Ashes	0.02=100

Summary. M. Guerin divides, as we have already stated, the gums into two classes. The first soluble in water. The second insoluble in that fluid.

The *gums arabic* and *senegal* are composed of a great proportion of arabine, a little chlorophylline, of a waxy substance, acetate of potassa, supermalate of lime (which explains why they are generally acid), traces of an azoted matter and various salts.

The *indigenous gums* are but slightly soluble in water; by boiling them for several hours in a large quantity of this fluid, they are transformed into arabine, which leads the author to think, that if the trees that furnish them, grew in the warm climates of Asia or Africa, they would afford arabine at once.

The *gum bassora* of commerce is composed of arabine, chloro-phylline azoted matter, supermalate of lime, acetate of potassa, &c.

Gum tragacanth contains arabine, a small quantity of insoluble starch, a substance having the greatest analogy with bassorine, but differing a little in its elementary composition.

Chlorine bleaches all the solutions of gums. If the solution be boiled, from a half to three quarters of an hour, to drive off the chlorine or hydrochloric acid, it may be employed for any process in the arts.

Sulphuric acid transforms the gums into two distinct products:

The first, improperly termed gum, does not afford mucic acid; the second, slightly acid, having a sensibly saccharine taste, does not undergo the vinous fermentation.

Nitric acid, in acting on arabine, starch, and sugar cane sugar, does not furnish malic acid, as is generally thought, but a new acid, wholly distinct from the known acids.

The mucilage of flaxseed is not an immediate principle, as has been supposed by Thomson and others; it is composed of arabine, an azoted matter, and a substance insoluble in water which does not afford mucic acid.

The mucilage of mallow root contains a little arabine, starch and asparagine.

1. *Elementary composition of Gums.*

Gums.	Carbon.	Oxygen.	Hydrogen.	Nitrogen.
Gum arabic				
senegal	43.59	50.07	6.23	0.11
cherry	43.69	50.08	6.23	
apricot	44.03	49.76	6.21	
plum	44.56	49.29	6.15	
peach	43.17	50.52	6.31	
almond	43.79	49.97	6.24	
bassora,				
soluble part	43.46	50.28	6.26	
tragacanth,				
soluble part	42 01	54.57	6.42	
insoluble part,	35.79	57.10	7.11	

2. *Immediate composition of Gums.*

Gums.	Water.	Ashes.	Arabine.
Gum arabic	17.60	3	79.40
senegal	16.10	2.80	81.10
cherry	11.20	1.50	87.30
apricot	6.82	3.33	89.85
plum	15.15	2.02	82.83
peach	14.21	3.19	82.60
almond	13.79	2.97	83.24
bassora	21.89	5.60	11.20*
tragacanth	11.10	2.50	53.30†

* And bassorine, 61.31.

† And bassorine and starch, 33.10.

3. *Quantity of Mucic Acid furnished by* 400 *parts of Nitric Acid and* 100 *parts of Gum.*

Gums.	Mucic acid.	Oxalic acid.
Arabine	16.88	a little
Bassorine	22.61	"
Gum senegal	16.70	"
cherry	15.54	"
apricot	15.97	"
plum	15.78	"
peach	14.99	"
almond	15.03	"
bassora, soluble part	15.42	"
tragacanth, soluble part	15.21	"
insoluble part	22.53	"

Journ. de Chim. Medicale, Dec. 1831.

ARTICLE XXIV.—*On the Metallic Base of Magnesia. By M. Bussy.*

When, in 1828, M. Woehler published his method of extracting the metal of alumine, by decomposing the chloride of aluminum by potassium, M. Bussy thought, from analogy, that glucinium could be separated from the chloride of that base by the same means, and the results confirmed this opinion. Since then, he has also isolated magnesium from its chloride. His memoir on this subject was read before the Royal Academy of Sciences on the 25th of January 1830, and of which the following is an abstract.

Preparation of the Chloride of Magnesium. Although magnesia heated to redness can be decomposed by chlorine, the chloride of magnesium is obtained with difficulty by this means; it may, however, be readily procured by previously mixing the magnesia with finely powdered charcoal. The

author advises equal parts of starch and calcined magnesia; after having mixed them thoroughly, by means of a small quantity of water, the mass is to be divided into small pieces, and strongly calcined in a crucible, preventing any access of air. This mixture is then to be introduced into a porcelain tube, through which a current of chlorine is to be passed, the tube being heated to redness. After some time the chloride of magnesium, which is fixed and fusible, flows along the porcelain tube and solidifies at the extremity. It then presents a white crystalline mass, presenting, on being broken, large brilliant laminæ which are slightly flexible, resembling spermaceti; it is very soluble in water, of a pungent and bitter taste, and strongly attracts moisture. It should be observed that Œrsted and others have already applied this procedure in the preparation of various other chlorides.

Preparation of Magnesium. To obtain this metal, M. Bussy takes a tube of glass of about half an inch in diameter and tolerably thick. This tube, which is to be about twenty inches long, is to be curved into the form of a retort at one of its extremities. After having introduced five or six fragments of potassium of the size of a pea both into the curved and straight parts of the tube, fragments of the chloride of magnesium are to be added, interposing some small pieces of porcelain between them to prevent the chloride fusing into a single mass. This portion of the tube is then to be heated, and when it is almost of a dull red, the potassium in vapour is to be passed through it by heating the curved part of the tube that contains it. A very vivid incandescence results which successively extends the whole length of the tube. When the tube has become cold, the internal mass presents white metallic globules disseminated through the undecomposed chloride. If this mass be heated with water, a disengagement of hydrogen ensues, which is owing to a small quantity of potassium; white flocculæ of magnesia are formed at the same time, owing to the decomposition of the chloride of magnesium by the potash, and brilliant globules fall to the bottom of the vessel,

having the whiteness and lustre of silver. They are to be separated by decanting the fluid and washing them several times in water.

Properties of Magnesium. This metal is of a silvery whiteness, very brilliant and malleable, flattening under the hammer, fusible at a not very elevated temperature, unalterable in dry air, losing its metallic brilliancy in a moist atmosphere, and becoming covered with a white coating of oxide; this effect, however, is very limited, and is confined to the surface of the metal; when very small fragments of magnesium are heated, exposed to the air, they burn, throwing out sparks like iron in oxygen; larger pieces are slowly converted into pure magnesia; pure water, deprived of air, has no action on magnesium; when boiling it disengages a few bubbles of hydrogen. Certain saline substances greatly favour the decomposition of water by magnesium; the diluted acids attack this metal with a disengagement of hydrogen. Magnesium does not amalgamate with mercury, except when aided by heat, in which case, a very small quantity is sufficient to destroy the fluidity of the quicksilver. When this amalgam is agitated in a glass vessel, it becomes covered with a metallic coating like the amalgam of bismuth.—*Annales de Chimie.*

[In the same number of the *Annales* from which we have extracted the above, is also a memoir by Liebig, on the same subject, which sheds additional light on the subject. This chemist observes that the chloride of magnesium can be obtained by an easier process than that recommended by Woehler. This is by evaporating to dryness, equal parts of hydrochlorate of magnesia and sal ammoniac, and projecting the mixture in small quantities at a time, into a platina crucible, at a red heat, and continuing the heat till the whole of the sal ammoniac has disappeared, and the chloride is in full fusion. The chloride thus obtained resembles pure mica. The magnesium is to be reduced as follows: ten or twenty globules of potassium, about the size of peas, are to be introduced into a perpendicular glass tube, of about three or four lines in

diameter; over the potassium is to be placed the chloride of magnesium, and the tube heated till the commencement of fusion, when it is to be so inclined as to permit the potassium to flow through the chloride. M. Liebig also states, that if the small globules of magnesium thus obtained, be mixed with chloride of potassium, and heated in an earthen crucible, that they will unite at a temperature not exceeding the fusing point of silver.—Ed.]

MISCELLANY.

Blue extracted from the Stalk of Buckwheat. (*Polygonum fagopyrum.*)—A blue colour, serviceable for dying, may be extracted from buck-wheat, in the following manner:

The stalks are cut before the grain has become mature; they are spread out upon the earth, exposed to the sun, and suffered to remain till the grain separate with facility. When this has been effected, the straw is collected, wetted, and allowed to ferment until decomposition takes place, and the heap have assumed a blue appearance. It is then formed into balls or cakes, and dried by the sun, or in a stove. These masses being boiled in water will impregnate it with a deep blue, which neither vinegar nor sulphuric acid will discharge. Alkalies will change it to a red; the powder of nutgalls reduce it to a perfect black; and, by evaporation, it will become a beautiful green. Stuffs dyed with this preparation, and by the usual method, take the dies from other vegetable substances; the blue is very beautiful, and the colour stands well.—*Journ. Etrang. and Journ. Frank. Instit.*

Gum-resin of the Olive Tree.—Dr Giadorou, of Sebenico, states, that the gum-resin of the olive-tree possesses purgative and tonic properties, and that he has used it with great success in the treatment of intermittent fevers. He gives it as follows:—An ounce and a half (Austrian weight) is divided into six parts, and one part taken every two hours. It produces two or three evacuations from the bowels, the appetite becomes excellent, and patients have told Dr G. that their strength has sooner revived after taking this remedy than when they have taken the quinine.

Dr G. states that he has given the remedy under notice in a great number of cases of epidemic intermittent fever, and with marked success. Several of these cases are related in the *Annali Universali di Medicina for June* 1831. *Amer. Journ. Med. Sciences.*

Persesquinitrate of Iron.—This article is strongly lauded by William Kerr, Esq. in a late No. of the *Edinburgh Medical and Surgical Journal*, as a remedy of great power in diarrhœa and some other affections of the mucous membrane of the alimentary canal. The following is his mode of preparing it:—"Take of small chips or pieces of iron wire, an ounce and a half; nitric acid, three ounces by measure; water, twenty-seven ounces; muriatic acid, one drachm.

"Put the iron into an earthenware vessel, and pour on the nitric acid, pre-

viously diluted with fifteen ounces of the water. Set the vessel aside till the whole of the acid has united with the iron, so as to form a persesquinitrate; then decant the liquid from the portion of iron which remains undissolved, strain and filter. Add the muriatic acid with the remainder of the water, or with as much of that liquid as shall increase the whole solution to thirty ounces.

"The solution is completed in a space of time varying from seven to twelve hours according to the concentration of the acid and the thickness of the iron. If a less dilute acid be used, the time will be shortened; but in that case the heat evolved is apt to be so great, as to produce other combinations of the iron and nitric acid. I have always been in the habit of using rather thick pieces of iron; and the time required for the completion of the process is then from nine to twelve hours; but a quantity made lately with bell wire, was completed in little more than seven hours. When the process is finished, the liquid has a red colour, so dark, that viewed by reflected light, it seems almost black. The evolution of gas is then no longer perceptible. Three ounces of nitric acid of the usual strength (1.4) generally dissolve an ounce of iron, so that when the process is completed, a portion of the metal remains undissolved. The solution then consists entirely of the persesquinitrate of iron; and, if speedily decanted, it may be preserved in that state; but if allowed to stand a few hours longer on the iron, it will undergo a further change, gradually becoming converted into pernitrate and protonitrate of iron. The first of these is insoluble, and renders the liquid turbid, and the latter, which remains dissolved, has not the medical properties which render the persesquinitrate valuable. Carbonate of soda throws down from the solution of the persesquinitrate a precipitate of a pure red colour; but if the process has been carried too far, such precipitate has more or less of a greenish tint. When the solution contains nothing but nitric acid and peroxide of iron, it slowly undergoes decomposition on standing; so that at the end of a few weeks the whole liquid begins to become turbid. The addition of some muriatic acid prevents this decomposition, and the quantity sufficient for this purpose is too small to affect the medicinal powers of the persesquinitrate. The solution, when rightly prepared, is of a beautiful dark red colour when viewed with transmitted light. Its taste is very astringent, and not at all caustic."

Mr Kerr says, that to an astringent power, this remedy unites the property of diminishing the irritability and tenderness of the mucous membranes, with which it comes in contact.—*Amer. Journ. Med. Sciences.*

Constituent parts of Cinchona.—According to Mr R. Battley, the constituents of cinchona cordifolia, as determined by analysis, are, 1st, a free acid, easily disengaged by distilled water; 2d, quinine, obtained by neutralizing the acid No. 1 with magnesia; 3d, quinine independent of that which is in combination with the acid No. 1; 4th, bitter extractive; 5th, resin; 6th, gummy matter; 7th, gluten; 8th, tannin, combined with gallic acid; 9th, colouring matter; 10th, muriate of soda; 11th, sulphate of soda; 12th, iron; 13th, woody fibre.

Quinine is a bitter substance of the bark, forming characteristic salts with acids, and not containing any of the principles from No. 4 to 13; it appears to be an elementary substance.

In the preparation of the *liquor cinchonæ cordifoliæ*, it has been attempted to combine all the efficient properties of the bark (excluding Nos, 6, 7 and 13, in

which no active principle can be discovered), and it is presumed that the object has been effected in that preparation.

The *sulphate of quinine* can only be partially efficient as a medicine, in consequence of the absence of all the properties above mentioned (from No. 4 to 13); and the decided superiority of the *liquor cinchonæ*, as a medicine, being fully admitted by many competent judges, it appears to me to be of importance to place that preparation under the attention of the profession at large.—*London Medical Gazette, December* 1831, *and Amer. Journ. of Med. Sciences.*

M. Biett's Formulæ for the Preparation of Pills of Proto-Ioduret of Mercury.—M. Biett employs the following pills in the treatment of syphilitic affections. 1st, R. proto-ioduret of mercury ℥j; powder of marsh mallow ℥j; M.; make into seventy-two pills. 2d, R. proto-ioduret of mercury ℈ij; thridace ℥ss; extract of guaiac ℥j; M.; make into forty-eight pills. M. Biett commences with one pill a day for the first three days, and gradually increases the number to three or four a day, never more than one however at a dose. M. B. at the same time, generally orders an infusion of the saponaria, with a little of the syrup of gum and of capillaire.—*Gaz. Med. Jan.* 1832 *and Amer. Journ. of Med. Sciences.*

Resin of the Cachou Nut.—M. de Mattos, has found that the cachou nut (*anacardium occidentale*) contains much gallic acid, tannin, extractive, a gum resin, and a green colouring principle. The resin is fluid at 60° F; somewhat translucent; of an oleaginous consistence; congeals at 50° F; its taste is acrid, pungent and very caustic; its colour is of a beautiful brown approaching to red. When placed in contact with the skin, it promptly produces vesication, and tinges the spot of a brown colour, which lasts for some time. It thickens in the air; at an elevated temperature, it burns with a vivid yellow flame, throwing out sparkling jets of fire. It is wholly insoluble in water; in alcohol it is soluble, but still more readily in ether. Sulphuric acid, somewhat diluted with water, dissolves it without the aid of heat; the solution is precipitated by water, which separates the resin unchanged. The pure acid decomposes it, as does nitric acid. The hydrochloric and acetic acids have no marked action on this resin. The soluble alkalies dissolve without decomposing it. Lime forms with it a viscid, thready and very adhesive paste, which may be useful in the arts. The fixed and volatile oils readily dissolve it. It also unites with fatty substances, wax and resins. This resin is easily obtained by treating the pericarp of cachou nuts by alcohol, separating the latter by distillation, and washing the resin well with hot water, to remove all the gallic acid and tannin. It may also be prepared by boiling the nuts in water, collecting the resin which floats on the fluid, and subjecting the marc to pressure, to separate that which still remains. Gallic acid is tolerably abundant in these nuts, and may be extracted to advantage; it may be obtained very pure by the following process. The aqueous solution of the nuts is to be evaporated to the consistence of an extract, and treated with alcohol of 38° B. The fluid is to be filtered, and a small quantity of potassa added, which unites with the gallic acid, and precipitates the tannin in the form of a blackish liquid, of an oily appearance. The alcohol after having become clear by standing, is to be decanted. It holds in solution the gallate of potassa, and is to be treated by the acetate of lead; the gallate of lead is to be washed and decomposed by diluted sulphuric acid, which will afford tolerably pure

gallic acid. M. de Mattos is of opinion that this resin may be advantageously used as a permanent revulsant.—*Journ. de Pharm. Nov.* 1831.

Styptic Powder.—Dr Bonnafoux, of Montpelier, states that the following powder will check very severe hemorrhages.

R.	Colophony	two parts,
	Gum arabic	one part,
	Charcoal	half a part.

to be well pulverised and mixed together.—*Jour. de Pharm.*

Sulphuret of Carbon.—M. Wutzer, has found this article to be one of the most diffusible and energetic of the stimulants, exciting the activity of the heart and arterial system, and producing a determination to the skin and kidneys. The dose is from three to eight drops, in mucilage or sugar.—*Ibid.*

Paste of Gum Tragacanth.—M. Mouchon, Jun. of Lyons, gives the following mode of making lozenges, which he states are preferable both in appearance and taste to those of jujube.

R.—	White gum of tragacanth, free from any impurities	64 parts,
	Fish glue, or dry gelatine from bones	96 parts,
	Water	3000 parts,
	Syrup of sugar at 25° and clarified	2000 parts,
	Orange flower water	128 parts.

The gum tragacanth is to be bruised and placed in a tin vessel for 48 hours, with 2500 parts of the water. The fish glue is to be dissolved in the remaining 500 parts of that fluid, and both solutions strained through a fine linen cloth. The syrup is to be heated to ebullition, and the whole mixed together, placed over a good fire, and constantly stirred till the mixture assumes the state of a soft paste. It is then to be taken from the fire, the orange flower water added to it, and evaporated over a water bath, until it has assumed sufficient firmness, when it is to be run into tin moulds, previously coated with a thin layer of oil of almonds. At the end of a few hours, it assumes a sufficient consistence to be divided into lozenges.—*Journ. de Chim. Med.*

Lozenges for cold in the head.—Spitta recommends the following preparation as beneficial in freeing the nasal fossæ from the feeling of obstruction in coryza.

R.	Pulv. cubeb.	℥ij
	Bals. tolut.	gr. vj.

Mix well, and then add

	Ext. glycirrh.	℥j
	Syrup. bals. peru.	℥j
	Gum arab.	q. s.

Rub well together, and make lozenges of ten grains each. One of these, on being placed on the tongue, gradually melts, and imparts a pleasant aroma to the mouth, whilst at the same time the obstruction of the nose disappears.—*Journ. de Pharm. Dec.* 1831.

Sub-Chromate of Lead.—MM. Vohler and Liebig give the following method of preparing this salt. The mode of operating by the moist way is well known.

Its discovery is due to M. Dulong. It does not appear that it will acquire a fine cinnabar red colour by this mode, the usual tint being of a deep orange. We have ascertained, that by melting the neutral chromate of lead, with nitrate of potassa, that a sub-chromate can be produced, of as beautiful a colour as the best cinnabar. The saltpetre is to be melted at low red heat, and small portions of pure chromate of lead successively added. At each addition of the latter, a violent effervescence takes place, owing to the disengagement of gas, and the mass becomes black; because the chromic red appears black as long as it is hot. The chromic yellow must be added until nearly the whole of the saltpetre is decomposed. Care must be taken not to heat the crucible too much, because too violent a heat will cause a brown, instead of a red colour. The crucible is now to be permitted to remain undisturbed for a few minutes, that the chromic red, which is heavy, may deposit, and the still fluid saline mass, composed of chromate of potash and saltpetre, is to be poured off. The chromic red remaining in the crucible, is to be treated with water, and after having been well washed, is to be dried. It is essential not to leave the saline solution too long in contact with the red powder, otherwise its brilliancy will be injured. Chromic red thus obtained is in the form of a powder, of a most superb cinnabar colour; when it is examined in a strong light, it is found to be composed of small crystalline plates.

The yellow chromate of lead is dissolved in large proportions by a concentrated and boiling solution of caustic potash. In a few days, this solution deposits groups of red crystals, which are composed of the sub-chromate, and not neutral chromate as has been stated.—*Annales de Chim. July* 1831.

New Metallic Dye.—M. Robiquet having been consulted by a dyer in Paris, as to the article used in colouring a piece of silk of a dark grey colour, which resisted the action of all re-agents, this able chemist instituted some experiments, which showed that it was produced by a salt of silver; and further, that in all probability, the metal had first been applied in the state of a nitrate, and then converted into a chloride. He in consequence imitated the dye by immersing the cloth into a solution of nitrate of silver, and then, after drying it, into a solution of chloride of lime, and afterwards exposing it to a strong light. Different tints can be produced by employing different strengths of the metallic salt. But it should be noticed, that unless the whole of the dyed article be exposed to the same degree of light, that the colour will not be uniform.—*Journ. de Pharm.*

Cement for Glass or China.—An ounce of pure gum mastic, is to be dissolved in q. s. of well rectified alcohol, and the same quantity of ichthyocolla steeped in water till soft, and then dissolved in alcohol; these solutions are to be mixed, and a quarter of an ounce of gum ammoniac added. The whole is now to be exposed to a gentle heat till perfectly amalgamated; when it is to be poured into a vial and kept well corked. When it is to be used, both the vial and the vessel to be mended are to be warmed, and the united fragments should be pressed in close contact for at least twelve hours—*Journ. des Connais. Usuel.*

New Principle in the Bark of the Pomegranate Root.—In a thesis presented to the Parisian School of Pharmacy, M. Latour de Trie announces the discovery of a new principle in the bark of the root of the pomegranate, and for which he proposes the name of *gravadine.* This substance is white, inodorous and of a slightly

saccharine taste. It presents various crystallizations. When in union with a small quantity of colouring matter, it crystallises in small conglomerated grains resembling a cauliflower, from which arise acicular crystals in silky tufts or stars. When entirely pure, it crystallises in a radiated form. When thrown on red hot coals, it burns, giving out a smell like that of burnt bread. When enclosed in a glass tube, and exposed to a gentle heat, it melts, and on cooling assumes a radiated crystalline form. At a high temperature, it emits a thick white smoke, which sublimes on the sides of the tube, in small granulated white crystals, leaving very slight traces of charcoal. It is perfectly neutral, is soluble in every proportion in cold water, slightly soluble in cold alcohol at 40°, much more so in hot alcohol, but precipitates on cooling.

Nitric acid rapidly dissolves it. When heated with four parts of hot nitric acid, it affords malic acid. Sulphuric acid dissolves it less promptly, and assumes a yellow colour which is permanent. When this is subjected to heat, it is transformed into water and a carbonaceous matter, which perhaps may be ulmic acid. Hydrochloric acid dissolves it very slowly, and on evaporation, again permits it to crystallise unaltered. It is soluble in potash and ammonia, and precipitated from all its solutions by the sub-acetate of lead. The salts of iron have no action on it. —*Journ. de Pharm.*

On the Powder of Milk. By M. Legrip.—The powder of milk added to water, forms an agreeable drink, and forms an excellent substitute for milk. It is made as follows.

Milk	two pints,
Carbonate of soda	half a drachm,
Water	one ounce,
Sugar	one pound.

The soda is to be pulverised and dissolved in the water, and this solution added to the milk; the mixture is then to be gently heated and constantly stirred. When it is three-fourths evaporated, the sugar is to be gradually added, and the whole briskly stirred. After it is perfectly incorporated, the mixture is to be removed from the fire, poured into plates, and dried in an oven. When perfectly dry, it is to be finely powdered and kept in well stopped bottles. One or two ounces are sufficient for a bottle of water.

Pastilles of Milk.—

Milk	two parts,
Vinegar	half an ounce,
Carbonate of soda	one drachm,
Syrup of orgeat	two ounces,
Sugar	two pounds,
Gum arabic	two drachms.

The milk is to be boiled and coagulated by means of the vinegar, and the curd subjected to pressure. The soda is to be pulverised and dissolved in the syrup of orgeat. The curd is to be divided and briskly rubbed in a marble mortar, adding very gradually the alkaline syrup, and the rubbing continued till the mass is perfectly homogeneous and dissolves entirely in water, when the sugar and gum are to be added. This forms a paste which is to be divided into pastilles and dried, at first in the open air, and afterwards in a stove by a gentle heat; these pastilles must be kept in close vessels.—*Journ. de Chim. Med.*

On the action of a mixed solution of the proto-nitrate and deuto-nitrate of mercury on azoted substances. By M. Lassaigne.—An accidental circumstance led us to observe the colouring property possessed by a solution of mercury in nitric acid, made by aid of a low heat, when it is placed in contact with silk or wool, at a temperature of 112° to 120° F.

M. Lebaillif, who is indefatigably occupied in microscopical and chemical researches, informed us, some time since, that he had observed, that a crimson colour was produced by the addition of nitrate of mercury to certain vegetable principles, and especially those which contained azoted matters. This learned chemist tried the effect of this reagent on a great number of substances, and found that the colour was most vividly developed by the action of the mercurial solution on substances of an animal nature; that among the vegetable substances, it was only produced in those which contained more or less azoted principles; and also observed that no colour was developed if the two nitrates were separately used.

These results having been communicated to us by M. Lebaillif, we made conjointly some new experiments, and found that the production of the colour always took place, where a nitric solution of mercury was used, containing both the proto and the deuto-nitrate.

The manifestation of the colour is readily produced by moistening a solid animal matter, as the dried white of egg, caseum, horn, bone, &c. with the mercurial solution, and exposing it to a gentle heat by placing it on a plate of platina; held five or six inches above the flame of a candle, it becomes red in eight or ten seconds, and soon assumes a rich crimson tint. To produce the same effect in a liquid animal substance, as milk, mucus, a solution of gelatin, &c., a drop of the mercurial solution is to be added to a drop of one of these substances, and the precipitate which forms well stirred with a glass rod, and then gently heated.

We were at first of opinion that all organic azotic substances might be thus coloured; but repeated experiments have convinced us that there are many exceptions, though we are unable to account for them. The following list will present these comparative results.

Substances which became red. Fibrine. Dried albumen. Liquid albumen. Vegetable albumen. Gelatine. Caseum. Gluten. Horn. Nails. Milk. Serous membrane. Mucous membrane. Fibrous membrane. White wool. White silk. Sweet almonds. Wheat flower. Gray paper.

Substances which were not reddened. Urea. Uric acid (became a little yellow). Allantoic acid. Cystic oxide. Osmazome. Cholesterine (became yellow). Picromel. Sugar of Milk. Ferment. Quinine and Cinchonine (somewhat yellow). Morphine and narcotine (yellow and afterwards reddish-brown). Oxalic, tartaric, malic and citric acids. Cane and beet sugar. Pure wheat and potato starch. Pure lignite. White paper. Cotton and linen thread.

From this list it is evident, 1st, that the red colour is not produced with all azoted substances; 2d, that those with which it is not produced, are such as are supposed to contain most azote; 3d, that those animal substances which are placed by chemists among the immediate neutral principles, present, with some few exceptions, this character; 4th, that among the compound vegetable substances, those which contain an azoted body, belonging to this class, become more or less red by heating them gently with the mercurial solution; 5th, that this action of the mer-

curial salt may be advantageously resorted to, to ascertain the purity of many immediate vegetable principles, as starch, sugar, gum, ligneous fibre, &c.; that is, whether these peculiar principles are not mixed with some of the azoted substances above enumerated.

These experiments induced us to try whether wool and silk might not be dyed by means of this salt. The trials we made on this subject, demonstrated that it was possible to communicate a purple colour of greater or less intensity to these substances, by placing them in contact with a nitric solution of mercury, made with one part of mercury, and two parts nitric acid of 28°, for ten or fifteen minutes, at a temperature of 112° to 120° F.

The solution of the mercury in the nitric acid is to be made by a gentle heat, and is then to be boiled for four or five minutes, to transform part of the proto-nitrate into deuto-nitrate. When it is used, it is to be diluted with an equal bulk of distilled water, and heated to the proper temperature, before the silk or wool is plunged into it. By this means we have imparted a colour to silk which appeared to resist the action of the light for a long time, and was unalterable by alkaline solutions, or diluted sulphuric or sulphurous acids. This colour appears to be owing to combination of the mercurial salt with the substance of the silk, as it is changed to a brown by the action of a hydrosulphate. We found that 100 parts of silk gained from 17 to 18 per cent in weight, by being subjected to the above mentioned process.—*Journ. de Chimie Medicale.*

ERRATUM.

Page 116, *fourth line from the bottom, for* Lake Erie *read* Lake Ontario.

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Fig. 1.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.
Fig. 7.
Fig. 8.

Drawn from Nature by W.P.C. Barton.

Tanner, Vallance, Kearney & Co. sc.

GILLENIA TRIFOLIATA.

(Indian-physic.)